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OF THE

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INDEX TO VOL. XXIV.

APRIL, 1917, TO MARCH, 1918.

NOTE.—References to Insects, etc., and Fungi are indexed under the headings "Insects, etc.," and "Fungi" only, to Weeds under the headings "Weeds" only, to Fruit under the heading "Fruit" only, and to General Notices, etc., issued by the Food Production Department of the Board under the heading "Food Production."

The names of the research and experiment stations at which the experiments summarised in the *Journal* have been conducted are indicated in italics, thus :—(*Rothamsted*). In the case of experiments conducted abroad, the name of the country is given.

Articles or reports on the following subjects appear in the *Journal* each month or from time to time, and are not separately indexed :—Notes on Feeding Stuffs Notes on Manures, Unit Prices of Artificial Manures, Notes on Crop Prospects, and Live Stock Abroad, Notes on the Weather, Notes on Agricultural Labour in England and Wales, Notes on Agricultural Conditions in England and Wales, Prices of Agricultural Produce, Outbreaks under the Diseases of Animals Acts, Prevalence of Animal Diseases on the Continent, Lists of Additions to the Board Library, and Selected Contents of Periodicals.

	PAGE
Accounts, *see Book-keeping.*	
Acorns for live stock	922, 986
Agricultural Companies, transfer of men to	1051
Agriculture :	
District Sub-Committees and their duties	344, 347, 460
District Wages Committee	754, 1138
Employment : Enquiry into	11
Executive Committees	315, 390, 1005
Land in County Boroughs	1007
Machinery and the Ministry of Munitions : Importation of, from the United States and Canada	924, 1031
Organisation Society	1232
Reconstruction : Report of the Agricultural Policy Sub-Committee	1
Research and education in England and Wales	1097
Returns and statistics :	
Acreage and livestock returns England and Wales, 1917	671, 927, 1049
Produce of crops	916
Produce, prices of and supplies of	1158, 1248
Wages Board 621, 754, 1047, 1138, 1160, 1327,	1485
,, members of...	1046
Work for convalescent soldiers in France	753
Agricultural Organisation Society, reorganisation	1232
Air raids and insurance for farmers and occupiers of land...	1486
Allotments, see *Small Holdings and Allotments.*	
Amos, A. : Some problems in the growth of silage crops	162
Antler moth, see *Insects.*	
Apples, see *Fruit.*	
Ashby, A. W. :	
Accredited farms and State farm management in the United States...	943
Cropping a ten-rod allotment	49
Associations, see *Co-operation and Credit.*	
Bare fallow, substitutes for	1274
Barker, B. T. P. : Cider fruit for table use	394
The value of cider apples and pomace as food for farm stock ...	530
Barley : Orders dealing with, see *Statutory Rules and Orders.*	
Covered smut of	1417
Basic slag, see *Manures.*	
Basket making by soldiers	1331

418609

PAGE

Beans : (Broad), inter-planted with potatoes 998
Canadian Wonder beans 1470
Inter-planted with turnips or rape 180
Storage of, for winter use 840
Orders dealing with beans, see *Statutory Rules and Orders.*
Beckenham Urban District Council, under the Cultivation of Lands Order, action of the 336
Bees : Isle of Wight disease 155, 1266
Syrup for bees 116
Beet : Beet sugar industry 1100, 1485
Syrup from sugar beet 1002
Storage of, for winter use 842
Berry, G. P. : Investigations carried on in cherry orchards in Kent ... 288
The cultivation of peas with potatoes 752
Biggleswade, market-garden district of 834, 950
Binder twine 923, 1488
Birkenhead, production of food in 551
Blackman, V. H. : Electric discharge and crop production 45
Blast-furnace dust, see *Manures.*
Board of Trade Journal 1332
Bond, J. R. : Haymaking machinery 129
Book-keeping : Cost of production of silage crops 168
Determination of the cost of production of farm crops 403
Net output from agriculture and its distribution 158
Wintering lambs on turnips, accounts for 634
Bottomley, Prof., comment on Dr. Russell's report on humogen 12
Brayley Hodgetts, E. A. : Peasant co-operation in Russia 637
Brenchley, Winifred E. : Effect of weeds upon crops 1394
Brewers' by-products, see *Feeding and Feeding Stuffs.*
Buckwheat, a late-sown crop 180
Bush fruit 1012
Butter, see *Dairying.*
Buxton Lime Firm's Cottage Gardens Association 555

Cabbages : Seedlings from greenhouses 107
Canning of fruit and vegetables, the 539
Cartridges and lead shot, supply for protection of crops ... 252, 253, 477, 590
Celery, cultivation of 1296
Cereal screenings, price of 476
Cheese, see *Dairying.*
Cherry orchards in Kent : Investigations carried on in, see *Fruit.*
Cider fruit for table use, see *Fruit.*
Clover : Growing wild white clover for seed 424
Clubs, see *Co-operation and Credit.*
Cold storage, Treasury grants for 1331
Cole, A. C. : Report of the infestation of the larvæ of the antler moth ... 514

Commissions and Committees :
Advisory Committee on the marketing and distribution of grain and potato crops of 1917 367
Agricultural Executive Committees, see *Agriculture.*
,, Policy Sub-Committee 1
Committee on the production and distribution of milk 450
Hop Control Committee 782
Joint Committee on propaganda and information 1316
Management Committee for dealing with the hop crop 591
Oats Control Committee 364
Poultry Advisory Committee 470, 591
Rabbits and Game Advisory Committee 1120
Temporary advisory committees for harvest 342

Comparative money value of feeding stuffs 733
Compensation claims arising out of action taken by Agricultural Executive Committees 111, 355, 569, 890, 1127
Compulsory powers, see *Cultivation of Land, and Statutory Rules and Orders.*
Convalescent soldiers, agricultural work for 753

PAGE

Co-operation and credit :
- Buxton Lime Firms Cottage Gardens Association 555
- Cheltenham and District Market Gardeners and Fruit Growers ... 338
- Co-operative dairies, manufacture of cheese in 170
- ,, milk depots 1050
- Credit to farmers 91, 114, 668, 1042, 1158
- Food production societies 202
- Pig-feeding schemes 90
- Potato clubs 89
- Progress of co-operative societies in India 453
- Short term credit for farmers 91, 114, 669
- Urmston and District Allotments Association 429
- West Midland Farmers' Association 337

Copyhold Acts, proceedings in 1916 under the 538
Concession to farmers growing extra grain 1460
Corn : The cultivation of rye as a grain crop 731
Corn Production Act, 1917 621
Cornish, E. C. V. : Experiments on the preparation of home-made rennet 307
Cost of production, see *Book-keeping.*
Couch-grass for feeding purposes 1441
Cranfield, H. T. : A new source of potash 526
Crèches, country... 1001
Credit, see *Co-operation and Credit.*
Cropping a ten-rod allotment 49
Crops :
- Agricultural returns in England and Wales, 1917 671
- Cost of production of farm crops 403
- Marketing and distribution of grain and potato crops of 1917 ... 367
- Restriction Order, 1917 482
- Returns of produce of crops in England and Wales 374

Crops on newly-ploughed grass-land 1454
Crosland, W. P. : Sterility in mares, with recommendations to breeders of heavy horses 1357
Cultivation of land :
- Allotments, see *Small Holdings and Allotments.*
- Bad farming, prevention of 1158
- Breaking up of grass-land and pastures 111, 349, 350, 351, 455, 605, 1065, 1228, 1453, 1454
- Determination of tenancies, where the Board have taken possession 459
- Increased food production, agricultural programme for 456
- Notice to grub bulbs and flowers—roots in the Isle of Ely 784
- Order, 1918, the 1280
- Circular letter as to 1277
- Payment of tithe where the Board have taken possession 374
- Revised agricultural programme for 1918 564
- Temporary entry on land for specific acts of cultivation 238
- Use of compulsory powers of 458
- See also *Statutory Rules and Orders.*

Dairy cattle : Economy in feeding cows 744
Dairying :
- Butter : Statutory orders dealing with butter, see *Statutory Rules and Orders.*
- Cheese : Cheese mites 1087, 1487
- Experiments with pepsin to replace rennet 57, 313
- ,, on the preparation of home-made rennet 307
- Manufacture of cheese in co-operative dairies, the 170
- New prices for 1480
- Skim milk cheese 175
- Statutory Orders dealing with cheese, see *Statutory Rules and Orders.*
- Cream Order, 1917, the 1030
- Milk :
- Committee on the production and distribution of milk 450
- Children as milkers 1050
- Combination in milk production 1307
- Co-operative Depots 1050
- Director of supplies 923

Dairying—*continued.* PAGE
Milk—*continued*
Economy in milk production 871
Milk supply, arable *v.* pasture land... 1304
Milk supplies and grass ploughing 1117
Orders dealing with milk, see *Statutory Rules and Orders.*
Prices, see *Prices.*
Profitable utilisation of surplus milk, the 322
Report of Committee on the production and distribution of milk 1133
Use of milk for cheesemaking 171
Damaged grain, see *Statutory Rules and Orders.*
Diseases of Animals Act, suspension of Article 21 1484
Diseases of plants, see also *Fungi and Insects.*
Annual report of the Horticulture Branch 146
District Sub-Committees of the Agricultural Executive Committees, see *Agriculture.*
Drainage:
Drain-pipes, provision of 462
Drainage of Lands Orders 1917 357, 358, 360, 361, 1040
Mole drainage 187, 1278
Work and ditching... 1158
Ducks, see *Poultry.*

Eales, N. B.: Cheese mites 1087, 1487
East Suffolk scheme for the distribution of sulphate of ammonia... ... 233
Education: City boys on the land 21
Short courses of agricultural training for soldiers 762
Education Branch: Report for the year 1915-16 385
Electric discharge and crop production, the overhead 45
Electro-Culture Committee 1333
Empire Settlement Committee's Report 641
Ensilage 162, 996, 1114, 1345
Exemption from military service, see *Labour.*
Eyre, J. Vargas: Report on the possibility of conserving surplus plums by drying... 275, 483

Farm colonies for discharged soldiers (*England*) 326
Farm tractors, see *Machinery.*
Farmers: Credit to 91, 114, 668, 1042, 1153
Prosecutions of, under Statutory Rules and Orders ... 1161, 1335, 1487
Feeding of live stock and increased food production 1180
Feeding and feeding stuffs (Poultry feeding, see *Poultry*). (Reference should also be made to the Monthly Notes from Cambridge Animal Nutrition Institute, the contents of which are not here indexed):
Acorns 922, 986
Appeal for economy in feeding addressed by the President of the Board to stock-keepers 116
Appointment of Director of Feeding Stuffs 779
Brewers' by-products for cattle 1141
,, yeast for stock feeding, use of surplus 190
Cattle and horse food, notice to sellers 1052
Cider apples and pomace as food for stock 530
Comparative money values of feeding stuffs 733
Couch grass for feeding purposes 1441
Damaged grain 366
Distribution of 1141
Economy in feeding for milk production 743
Fodder shortage and the farmer's task 1316
Foods on which animals may and may not be fed 448
Forage for Food Production Horses 1160
Maintenance of supplies of hay and other fodder crops
Oil cake, distribution of 1141
Pig-feeding, see *Live Stock—Pigs.*
Sugar beet for stock 784
Warning as to use of grain fit for human food... 917
Fertilisers, see *Manures.*
Findlay, Prof. J. J.: Education of city boys on the land 21
Flax cultivation notes 1241

	PAGE
Flax, Orders dealing with, see *Statutory Rules and Orders.*	
Flax Production Branch	1147
Fleming, J. : Pig-feeding in war-time	721, 826
Flour mills Orders, see *Statutory Rules and Orders.*	
Flue-dust, see *Manures, Blast-furnace Dust.*	
Food Orders, see *Statutory Rules and Orders.*	
Food Production :	
Agricultural land in county boroughs	1007
Bad farming	1158
Charges for tractor ploughing	1006, 1455
Claims for compensation	890, 1127
Colleges, help of, in food production	106
Credit to farmers	668, 1042, 1158
Cultivation of Land Orders, withdrawal from possession	1011
Food conservation	593
,, ,, production by school children	207
,, ,, societies	202
,, supply in peace and war, the national	615
Glass jars for fruit and vegetables	1124
Grain, concessions to farmers growing extra	1460
Harvest programme for 1918	893
Help from glass-house owners in the supply of spring cabbages ...	107
Horse-drawn implements	897
,, purchase scheme	1004
,, scheme	1004, 1458
Horses, military, loan to farmers	234, 1041
Implements, hiring of	1040
Inspection of preserved fruit and vegetables	1040
Local authorities and cultivation of gardens	106
Milk supply—arable *v.* pasture land—statement by Mr. Prothero ...	1304
Oats, supply of	1154
Parasitic mange in loaned horses	1041
Ploughing of grass and cultivation of land	888, 1228
,, up grass land, effect on tenants' covenants	1287
,, of land, entry on land for	1286
Potato seed scheme	1130
Potatoes, supply of seed for 1918	899
Progress of ploughing of grass and cultivation of land	1285
Regulations as to sales of live cattle and dead meats	1149
Scheme for employment of German prisoner ploughmen	1291
School gardens	1125
Strawberries and bush fruit	1012
Suggestions to dairy farmers in breaking and cropping grass land ...	1228
Supplies Sub-Committee, duties of	460
Supply of teams of horses for ploughing	896
Training of horse ploughmen	1004
Forestry : Development Commissioners' report on	1101
Farming *v.* Forestry, war-time profits	63
Forewomen, training of, for planting forest trees	1043
Larch volume tables	1430
Reconstruction : Forestry Sub-Committee's report	1251
Timber Orders	481
Tree planting by women's supervision	1043
Fruit (see also *Insects, Fungi and Spraying*) :	
Apples : Cider apples and pomace as food for farm stock	530
Cider fruit for table use	394
Bush fruit, acreage not to be increased...	1012
Canning and bottling of fruit and vegetables	539, 1124
Cherry orchards in Kent, investigations in	288
Co-operative Association at Cheltenham	338
Drying and pulping stations for the preservation of surplus fruit and vegetables	593
Drying fruit and vegetables	547
Fruit, orders dealing with...	478, 479, 480
Glass jars for bottling	367, 1124, 1484
Grease banding fruit trees	750

Fruit—*continued.* PAGE
Permission to import gooseberry plants into Sweden 477
Preservation of fruit and vegetables without sugar 366
Preserved fruit and vegetables, necessity for inspection 1040
Prohibition of imports of currants and gooseberries into Canada ... 779
Railway transport 592
Report on the possibility of conserving surplus plums by drying ... 275, 483
Strawberries, acreage not to be increased 1012
Fryer, J. C. F. : Investigations on capsids which attack apples 33
Insect pests on basket willows 844
Fuller-Maitland, A. : Notes on rat-traps 729
Fungi (see also *Spraying*) :
American gooseberry mildew : Report of Horticulture Branch ... 146
Apple canker 1263
,, mildew : Report of the Horticulture Branch 154
Bacillus phytophthorus 653
Blackleg or black stem rot of potatoes 653
Blossom wilt and canker disease of apple trees 504
Club root or finger-and-toe 998, 1330
Corky scab : Report of the Horticulture Branch 153
Leaf spot of celery 68
Monilia cinerea 504
Nutritive value of edible fungi 416
Parsnip disease 1123
Phytophthora infestans, see *Potato "blight."*
Potato "blight" 265
Septoria apii 68
Smut in oats and barley 1417
Wart disease of potatoes : Report of Horticulture Branch... ... 149
Reports on the immunity trials at Ormskirk in 1915-16-17 ... 801

Game :
Orders dealing with, see *Statutory Rules and Orders.*
Pheasants and other game pests, destruction of 370, 1273
Rabbits, destruction of 250, 368, 369, 1273
Rabbits, a home industry 1121
,, supply of 1120
Gardening :
Expert advice on 109
Importance of 109
Gardens in war time 205
Glass jars for bottling fruit and vegetables, see *Fruit.*
Glenny, W. W. : The cultivation of the leek 66
Gooseberries, see *Fruit.*
Government Orders affecting agriculture : Information as to, to be given in plain language 1333
Grain, see *Corn* and specific crops.
Grain, orders dealing with, see *Statutory Rules and Orders.*
Grants for agricultural education and research 385
Grass land, breaking up of, see *Food Production, Cultivation of Land.*
Grazing of pigs in Kent 439
Grease-banding fruit trees 750
Guaranteed prices, see *Prices.*

Harbord, A. : Grazing of pigs in Kent 439
Harper Adams Agricultural College, experiments on humogen 15
Notes on poultry-feeding 78, 1105
Harvest programme for 1918 893
,, weather forecasts 373, 478, 592
Hay :
Maintenance of supplies of hay and other fodder crops 649
Orders dealing with hay, see *Statutory Rules and Orders.*
Hay-making machinery 129
Heather and moor burning for grouse and sheep (notice of book) ... 127
Hop-sprouts as food 1452
Hops :
Appeal to growers to reduce their acreage under hops 113
Hop Control Committee 782

Hops—*continued.* PAGE
Legal position as to grubbing hops 113
Order to reduce the acreage under hops in England and Wales ... 371, 691
Produce of 925
Purchase of the hop crop by the Government 591
Horse chestnuts, scheme for harvesting 684
Horses, see *Live Stock.*
Horticulture :
Annual report of the Horticulture Branch for the year 1916 ... 142
Appointment of horticultural representatives of the Food Production Department 108
Expert advice on gardening 109
Gardens in war-time 205
National service regulations for gardeners 109
Protection of peas from birds and mice 208
Sprayers and spraying materials, see *Spraying.*
Supply of cabbage seedlings from greenhouses 107, 553
Humogen, report on 11

Imms, A. D. : Report of the infestation of the larvæ of the antler moth... 514
Implements and harness, local supplies of 579
Improvement of live stock in England and Wales 497
,, of local transport 1328
Information as to Government Orders affecting agriculture to be given in plain language 1333
Insects (see also *Spraying*) :
Antler moth, report of the infestation of the larvæ 514, 523
Capsids attacking apples 33, 154, 1401
Capsid bugs : Report of the Horticulture Branch 154
Charæas graminis 514, 523
Cheese mites 1087, 1887
Colorado beetle : Report of the Horticulture Branch 153
Diaspis pentagona: Report of the Horticulture Branch 153
Galerucella beetle 847
Insect pests of basket willows 844, 1159
Large larch sawfly, report of the Horticulture Branch 152
Musk beetle 847
Nicotine and soap spray 850, 851
Orthotylus marginalis 34
Plesiocoris rugicollis 34
,, ,, report of the Horticulture Branch 154
Psallus ambiguus 34
,, ,, report of the Horticulture Branch 154
Phylloxera, report of the Horticulture Branch 153
Phylloxera in Italy 1159
Wasps, destruction of 370
Willow aphides 845
,, beetles 846
,, gall midges 849
,, moths 848
,, sawfly 847, 848
,, weevil 847
Insurance against air raids 1486
Intercropping and catch-cropping in Belgium 646
Isle of Wight bee disease, see *Bees.*
Italian rye-grass for silage 165

Jörgensen, J. : Electric discharge and crop production 45

Labour :
Agriculture and recruiting 99, 104, 242, 339, 569, 764
Agricultural furlough for sheep shearers 344
Children as milkers 1050
Exemption from Military service for farm work 569, 764
Harvest labour : National service scheme 341
,, ,, Soldier labour for hay and corn harvests 465, 466
Labour for the 1918 programme 573, 574, 575, 579
Labour sub-committees of the Agricultural Executive Committees ... 345

Labour—*continued.* PAGE

Loan of military horses to farmers 234
National Salvage Council 1488
National Service : Employment of volunteers 240
Regulations for gardeners 109
National Service Department : Temporary Advisory Committees for harvest 342
On small holdings 105
Payment for tractor ploughmen 1156
Prisoners of war, employment of civilian prisoners 242, 572
German prisoner ploughmen : Horse officers and commissioners 1290
Prisoners of war : Military prisoners 467
Prisoner ploughmen 1289, 1291
Public school boy 1000
Release of soldiers for agriculture 104
School-boy labour 1459
Short courses of agricultural training for soldiers 762
Soldiers, basket-making by 1231
,, extension of leave for 1157
Soldier labour 97, 241, 465, 466, 482, 761, 762, 1156, 1488
For drainage, etc. 1158
For tractors 1155
For owners of threshing tackle 761
Tractor ploughing, charges for 1006, 1455
Training of ploughmen 1004, 1156
Transfer of men to agricultural companies 1051
Women, see *Women.*

Land settlement of ex-service men, scheme for the 326
,, ,, for discharged soldiers in Ontario 452
,, ,, Empire Settlement Committee's report 641
Larch, volume tables for 1430
Lead shot, see *Cartridges.*
Leaflets in 1917 483, 1052
League of National Safety 886
Leek, the cultivation of the 66
Lees, A. H. : Nicotine-paraffin emulsion 1411
Lime, see *Manures.*
Linseed, a late-sown crop 180
Live Stock :

Agricultural returns for England and Wales, 1917 672
Annual Report of the Board's scheme for the improvement of live stock 497
Cattle :
Army cattle purchase 691
Bracken poisoning in cattle 1446
Calf rearing 963
Cattle and horse food, notice to sellers of 1052
Dairy cows, register of 1003
Economy in feeding 116, 118, 854, 955
Feeding of, and increased food production 1180
Notes on feeding 1109
Orders dealing with cattle, see *Statutory Rules and Orders.*
Poisoning by ragwort... 433
Commissioners of areas 1471
Horses :
Economy in feeding horses 854
Feeding of town horses 1476
Forage for food production horses 1160
Future position of light horse breeding, the 93
Horse scheme : Temporary assistant horse officer 1458
Horses Rationing Order 362, 780
Light horse breeding encouragement and improvement of ... 1384
Loan of military horses to farmers 234, 1041
Names and routes of the super, King's and Board's premium stallions 209
Orders dealing with, see *Statutory Rules and Orders.*

Live Stock—*continued.* PAGE
Horses—*continued.*
Sterility in mares, with recommendations to breeders of heavy horses 1357
Teams for ploughing, see *Food Production.*
Pigs :
Acorns for food 922
Advisory Committee on pig-keeping 1478
Castor bean-meal for pigs 1444
Cider apples and pomace fed to pigs 530
Economical feeding of pigs 436, 1213
Grazing of pigs in Kent 439
Hardy-thrifty-grazing pig 1451
Maisemore Pig Club 1270
Open air pig-keeping in Kent 90
Pig-feeding in war time 721, 826, 978, 1213
,, on kitchen waste 1107, 1215
,, for allotment-holders 1214, 1478
,, in farms : out-of-door methods 1216
,, in towns and villages 420, 1214
,, schemes 90, 1214, 1216
Swine Fever (Regulation of Movement) Order, 1917 473
Policy of the Board of Agriculture and Fisheries, and the Ministry of Food 1177
Report for 1916 of the proceedings of the Board under the Diseases of Animals Acts, etc. 373
Restriction of slaughter 1148
Suspension of Order, Article 2 ; prohibiting importation of certain live stock from scheduled countries 1484
Local transport, improvement of (a circular letter) 1328
Loose, A. : Wintering lambs on turnips 634

Machinery (see also *Petrol*) :
Control of steam-tackle by Agricultural Executive Committees ... 464
Farm tractors 582, 878, 1165, 1465
Ford tractor and Oliver M.O.M. plough 1456
Hay-making machinery 129
Hiring of implements 1040
Horse-drawn implements 897
Importation of agricultural, from U.S.A. and Canada 1051
Inspection of steam engines 1448
Local supplies of implements and harness 579
Machinery Sub-Committees of the Agricultural Executive Committees 345
Motor-ploughing under the Ministry of Munitions 239
Motor-tractor scheme 758
Policy of the Food Production Department with regard to tractors ... 582
Selection of land for tractor ploughing 759
Soldier labour for owners of threshing-tackle 761
Steam-tackle, increased use of 1288
Mackenzie, K. J. J. : Pig-feeding in war time 721, 826
Maisemore Pig Club, the 1270
Maize : A late-sown crop 181
Statutory Orders dealing with maize, see *Statutory Rules and Orders.*
Weekly official prices for maize 111
Manures (see also *Specific Crops*). (Reference should also be made to the Monthly Notes from the Rothamsted Experimental Station, the contents of which are not here indexed) :
Basic slag, supplies and prices for 1917-18 580, 783
Yields of grass from various kinds of 819, 1002, 1077
Blast-furnace dust 526, 582, 852, 1334
Cargo of superphosphate at Hull 248
Chalk on heavy soils 868
Composts 1114
Compound fertilisers, maximum price for 917
Fertilisers for farm crops 1426

Manures—*continued.* PAGE

Lime on heavy soils 868
„ provision of... 462
Mineral phosphates to replace superphosphate 197, 1077
Nitrate of Soda Executive 1329
Nitrogen Products Committee 1254
Potash, a new source of 526, 852
Potassium compounds general licence 922, 1334
Rock phosphates on grass land 1077
Seaweed 870
Soot 870
Sulphate of ammonia 462, 859, 861, 1069, 1111, 1329
„ „ and nitrate of soda, notes on 1111
„ „ East Suffolk scheme of distribution 233
„ „ for the season 1917-1918, prices of 372
Superphosphate Order 687, 689
Market garden district of Biggleswade 834
„ gardens, cropping of 1462
Marketing and distribution of grain and potato crops of 1917 367
„ of surplus produce of allotments and gardens 1461
Marshall, F. H. A.: Sterility in mares, with recommendations to breeders of heavy horses 1357
Maw, P. T.: Farming *v.* Forestry 63
Meat, Orders dealing with, see *Statutory Rules and Orders.*
"Meatless Day" 1153
Postponement of date for the coming into operation of the 60*s.* beef price 787
President of the Board on beef production in time of war 567
Military service, see *Labour.*
Milk, see *Dairying.*
Ministry of Food and Potato Crop 1918 1135
Ministry of Munitions and agricultural machinery 924
Mole drainage 187, 1276
Motor ploughing, see *Machinery.*
Mustard for seed 1012

Nation's Food, the; Revised agricultural programme for 1918 564
National egg-laying test 668
„ Food Journal 692
„ food supply in peace and war 615
„ Safety, League of 886
„ Service Volunteers, see *Labour, Women.*
Net output from agriculture and its distribution 158
Newton, D.: Is onion-growing worth while? 1378
Nicotine paraffin emulsion 1411
Nosema apis, see *Bees—Isle of Wight Disease.*
Nutritive value of edible fungi, the 416

Oats:
Control Committee... 364
Desirability of crushing before feeding to stock 1317
Silage 165, 181
Statutory Orders dealing with oats, see *Statutory Rules and Orders.*
Supplies of seed oats 1154, 1317
Unsuitable for sowing in thin wheat crop 179
Oldershaw, A. W.: Yields of grass from various basic slags ... 819, 1002
Onions: Cost of cultivation 1378
Increase in acreage suggested 1466
Storage for winter use 841
Orders, see *Statutory Rules and Orders.*
Orwin, C. S.: The net output from agriculture and its distribution ... 158
Osiers, cultivation of 1330

Panel of patriotic gardeners 109
Parasitic mange in loaned horses 1041

PAGE

Parkinson, S. T. : Report on the possibility of conserving surplus plums by drying... 275, 483
Parsnip disease, see *Fungi.*
Pastures : Breaking up of pastures, see *Food Production, Cultivation of Land.*
Peasant co-operation in Russia 637
Pepsin, see *Dairying-Cheese.*
Petherbridge, F. R. : Control of the apple capsid bug by spraying ... 1401
Investigations on capsids which attack apples 33, 1401
Petrol and paraffin 463, 1457
Licences for 1331
Supply to poultry-keepers 1481
Pheasants, see *Game.*
Phylloxera in Italy 1159
Pigeon shoots 1122
Warnings as to carrier pigeons 1159
Pigs, see *Live Stock.*
Ploughing of grass and cultivation of land 888, 1304
,, ,, on dairy farms (letter from the President) 1306
Plums, see *Fruit.*
Poisonous plants, notice of book 127
Ragwort 433
Pollination problems in cherry orchards 288
Pomace, see *Fruit—Apples.*
Potash, see *Manures.*

Potatoes :
Average profits on potato sales 1130
Base price of 1137
Clubs 89
Cultivation of peas with potatoes 752
Diseases of potatoes, see *Fungi.*
Distribution of seed potatoes through County Agricultural Executive Committees 900
Grown from single eyes 876
Guaranteed minimum price 238
In home-made bread 1123
Interplanted with broad beans 998
Marketing and distribution of 1917 crop 367
Potato, the, as a war crop... 1225
Potato crop, 1918, and Ministry of Food 1135
,, ,, ... 1222
,, ,, Memorandum of arrangements for, in Great Britain 1223
,, 1917, Restriction Order 1917 684
Retail price 238
Sale of, for eating 1023, 1130
Scheme for distribution of potato seed 900, 1132, 1275
Spraying, see *Spraying.*
Statutory Orders dealing with potatoes, see *Statutory Rules and Orders.*
Storage of potatoes 629
Supply of seed for 1918 899, 1275

Poultry :
Egg production in winter 1103
Feeding of poultry, suggestions for use of foods not suitable for human consumption 189, 1133
National egg-laying test 668
Notes on feeding 78, 446, 664, 1105, 1133
Petroleum and paraffin for poultry-keepers 1481
Poultry Advisory Committee 470, 591
Rationing foodstuffs for... 1318, 1319
Recipe for bottling chicken 750
Runner ducks as farm layers 748
Sitting of eggs of utility breeds of poultry 1482
Poverty Bottom : An experiment in increased food production 1186

	PAGE
Prices :	
Basic slag for the season 1917-18	580
Cereal screenings	476
Grain prices for 1918 crops	1334
Guaranteed prices : Potatoes	238
,, ,, (Report of the Agricultural Policy Sub-Committee)	5
Maize, weekly official prices	111
Maximum retail and wholesale prices	1322
Milk prices	110, 111, 1332
Statutory Orders dealing with prices, see *Statutory Rules and Orders.*	
Sulphate of ammonia up to 31st May, 1918	372
Prime Minister's message to agricultural labourers	1147
Prisoners of war, employment of, see *Labour.*	
Profits : War-time profits : Farming *v.* Forestry	63
Prosecutions of farmers under Statutory Rules and Orders	1161, 1335, 1487
Prothero, R. E. :	
Arable *v.* Pasture Land	1304
Beef production under war conditions	567
Letter to the Rt. Hon. Henry Hobhouse	456
On the use of compulsory powers	458
Profitable utilisation of surplus milk	322
Woman labour on the land	468
Rabbits, see *Game.*	
Ragwort, see *Weeds.*	
Rape for silage	165
Rape pastures	182
Rats, destruction of	251, 1364
Rat-traps, notes on	729
Recruiting, see *Labour.*	
Rennet, see *Dairying—Cheese.*	
Rent : Restriction on raising agricultural rents	626
Reports :	
Agricultural Policy Sub-Committee	1
Board's live stock scheme in 1916	497
Breaking up of grass land	605
Committee on the production and distribution of milk	450, 1133
Development Commissioners' Report for England and Wales, 1916-17	1096
Education Branch for the year 1915-16	385
Empire Settlement Committee, The	641
Forestry Sub-Committee of the Reconstruction Committee	1251
Horticulture Branch for the year 1916	142
Humogen	11
Nitrogen Products Committee	1254
On the infestation of the caterpillars of the antler moth	514, 523
Proceedings of the Board under the Diseases of Animals Acts, etc.	373
Proceedings of the Board under the Tithe, Copyhold, Commons and other Acts	537
Spraying of potatoes, the	1268
Restriction Orders, see *Statutory Rules and Orders.*	
Rigg, T. : The market district of Biggleswade, Bedfordshire	834, 950
Robertson, G. S. : Trials on grass land with basic slag and rock phosphates	1077
Rooks, destruction of	250
Rothamsted Experimental Station : Report on humogen	11
Russell, Dr. E. J. : Report on humogen	11
Rye as a grain crop, the cultivation of	731
Rye for silage	165
Salmon, E. S. : An experiment in the treatment of covered smut in barley	1388
Potato spraying for farmers	265
School gar ens and food production	1125
Scottish Journal of Agriculture	1332
Seeds :	
Economy in the use of seed grain	87, 994
,, ,, vegetable seeds	713, 995

Seeds—*continued*. PAGE
Government seed-testing station 705, 783, 925, 937, 996, 1031, 1035, 1070, 1202
Growing wild white clover for seed 424
Hints to farmers on purchase of 1074
Mixtures for pastures 184
Mustard 1012
Production of vegetable and root seeds in the United Kingdom ... 1464
Quality of agricultural seeds, report on 1202
Seed production in Canada 726
Seed supplies, advice to buyers 1468
State action for the provision of pure seeds, see also under *Government Seed-testing Station* 705, 726, 925, 937, 1070
Supply of No. 1 Manitoba wheat for seed purposes 1468
Supplies of wheat for autumn sowing 468, 469, 686
Senecio Jacobœa (ragwort), poisoning of cattle by 705
Shallots, storage of, for winter use 841
Sharpe, R.: Rats, how to exterminate them 1364
Sheep-shearers, agricultural furlough for 344
Shortage of cattle food: Official statement 1477
Silage; Improvised methods of making 1345
Notes on 996, 1114
Problems in the growth of crops for 162
Skim milk cheese, see *Dairying—Cheese.*
Small holdings and allotments (see also *Co-operation and Credit*):
Allotments in 1918... 1257, 1439
Beckenham District Council, action under the Cultivation of Lands Order 336
Birkenhead, production of food in urban centres 551
Co-operative trading for allotment holders 1463
Cropping a ten-rod allotment 49
Gardens of vacant houses under the Cultivation of Lands Order ... 106
Llandudno allotment district, a correction 1487
Local authorities and allotments (letter by Sir A. Lee) 1460
Notice to extend period guaranteed to allotment holders 239
Pooling of labour on small holdings 105
Stoke Newington allotments under the Cultivation of Lands Order... 556
Urmston and district allotments 429
War-time allotments 1119, 1435
West Bridgford Allotment Holders Association, the 883
Snell, John: An invasion of the caterpillars of the antler moth into Yorkshire... 523
Societies, see *Co-operation and Credit.*
Soldiers on the land, see *Labour.*
Somerville, W.: Poverty Bottom: An experiment in increased food production 1186
Sparrows, destruction of 250
Spraying:
Apple trees for capsids 36, 154
Copper sulphate, prices of 1484
Fruit trees in spring for caterpillars and aphis... 1413
Nicotine paraffin emulsion 1411
Potatoes grown by small cultivators 367
Potato spraying campaign 265, 1118, 1297
Provision of sprayers and spraying material by the Food Production Department 250
Report on potato spraying, 1917... 1268
State Farm Management Contest in the United States 943
Statistics, see *Agricultural Returns.*
Statutory Rules and Orders:
Bacon, Ham and Lard (Maximum Prices) Order, 1917 676
Barley (Requisition) Order, 1917 235, 1479
„ (Restriction) Order, 1917 683
Beans Peas, and Pulse (Retail Prices) Order, 1917, general licence... 1301
Beef Prices Order, postponement of 787
Blast Furnace Dust Order 582

Statutory Rules and Orders—*continued.* PAGE

British Cheese Order, 1917, the 910, 1140
Butter (Maximum Prices) Order, 1917 678, 775, 909
" " " Amendment Order, 1917 906
Cattle and Meat (Returns) Order, 1917 584
Cattle Feeding Cake and Meal, and Millers Offals Order, 1917, the ... 914
" " Stuffs (Committees) Order, 1917 1142
" " " (Licensing) Order, 1918 1310
" " " (Maximum Prices) Order, 1918 1474
" " " (Priority Supply) Order, 1918 1307
" " " (Requisition) Order 1308
Cattle (Sales) Order, 1917 1150
Cheese (Maximum Prices) Order, 1917 677, 776, 1140
Chopped hay and straw 364
Compound fertilisers, maximum prices 917
Copper Sulphate Order, 1918 1482
Cream Order, 1917 1030
Crop (Restriction) Order, 1917, the 482, 684
Cultivation of Land (County Boroughs) Order, 1917 1009
" " 1918 1280
Damaged grain 366
Damaged Grain, Seeds and Pulse Order, 1917 1026
Dealings in Oats (Restriction) Order, 1917 364
Deer (Restriction of Feeding) Order, 1918 1319
Diseases of animals, suspension of article 2 1484
Drainage of Lands Order, 1917 357
" " " (No. 2) 360, 1040
Dredge Corn Order, 1917 1028
Edible Offals (Maximum Price) Order, 1918 1313
Eggs (Restriction) Order, 9118 1481
Flax grown in the United Kingdom, Order taking possession of ... 690
Flax Seed (Ireland) Order, 1917 588
Flour Mills Order, 1917 236
" " " No. 2, ... 585
Food Control (Milk Requisition) Order, 1917 1029
Grain (Prices) Order, 1917 673
Amendment to 1301
Grouse and Black Game (England and Wales) Order, 1917 590
Home-grown Timber Prices (Great Britain) Order, 1917 481
Hops, reduction in acreage 371
Hops (Restriction) Order, 1917 684
Horses (and Poultry) Mixture Order, 1917, the 1023
" " " " " General Licence ... 1318
Horses (Prohibition of Exportation from Ireland) Order, 1917 ... 589
" (Rationing) Order, 1917 362, 780
Killing of certain migratory wild birds 591
Live cattle and dead meat, regulations for dealings in 1149
" stock, maximum prices for 1152
Live Stock (Restriction of Slaughter) Order, 1917 1148, 1152
" " " " " authorisation as to granting licences 1322
Live Stock (Restriction of Slaughter) Order, 1917, general licence... 1322
Maize, Barley and Oats (Restriction) Order, 1917 366
Meat Control Order, 1917 1044, 1149
" (Licensing of Wholesale Dealers) Order, 1918 1473
" (Maximum Prices) Order, 1917 675
" " " " Amendment of 1154, 1473
" (Maximum Prices) Order, 1917, general licence 1322
" Restriction Order 1152
Milk Orders 110
" Amendment Order 1138
" Factories (Restriction) Order, 1917 904
" (Prices) Order, 1917 680, 1050, 1332
" (Registration of Dealers) Order, 1918 1301
" " " Postponement Order, 1918 1481
" General licence under 1301, 1332

Statutory Rules and Orders—*continued.* PAGE
Milk (Returns) Order, 1917 584
,, Use of, in chocolate 1135
Oat and Maize Products (Retail Prices) Order, 1917, the 365
Postponement of 1044
,, ,, No. 2. 365
Oatmeal (Restriction) Order, 1918 1480
Oats Products (Retail Prices) Order, 1917, the... ... 1013, 1153, 1479
Oils, Oil Cakes and Meals (Requisition) Order, 1917 1046
Onions Order, 1917, the 1130
Petrol and paraffin... 1457
Pigs (Maximum Prices) Order, 1917 924, 1031
,, Exceptions for feeding sows and small pigs 1147
Potassium Compounds Order 922
Potato Bags (Returns) Order, 1917 784
Potatoes Order, 1917 684, 765, 1023
,, (No. 2), 1917 1001
,, general licences 1021, 1049, 1129, 1470
Base prices under 1137
Potatoes :
Distribution Order 1298
,, ,, Notice under 1470
(Growers' Returns) Order, 1917 898, 1130
Potato Bag Order, 1918 1298
Potatoes (Protection) Order, 1918 1471
Profits on sales of 1130
Poultry (and Horses) Mixture Order, 1917, the 1023
Prohibition of lifting hay and straw 585
Rabbits Order, 1917 369
,, (Prices) Order, 1918 1321
Raspberries (Jam Manufacturers' Prices) Order, 1917... 479
,, (Scotland) Delivery Order, 1917 480
Restriction on slaughter of calves withdrawn 235, 1148
Restrictions in the use of wheat-straw 476
Sale of hay and oat and wheat straw 110, 586
,, Horses Order, 1917 471, 589
,, Wool Order, 1917 247
,, Wool (Great Britain) Order, 1917 474
Seeds, Nuts and Kernels Order, 1917 1045
Seed Potatoes (Immune Varieties) Order, 1917 689
,, (1917 Crop) Prices Order, 1918 1299
,, (Prices) Order (No. 2), 1917 237, 1021
,, ,, ,, (No. 3), 1917 238
,, Order (1917 Crop) 1014
Sheep and lamb pelts, control of 248, 777
,, (Sales) Order, 1918 1319
Sheep-skins (Sale) Order 1155
Slaughter of calves, restriction withdrawn 235, 1148
Standing Timber (United Kindgom) Order, 1917 481
Stone Fruit (Jam Manufacturers' Prices) Order, 1917 478
Superphosphate Order 686
Swedes (Prices) Order, 1917 111
Swine Fever (Regulation of Movement) Order, 1917 473
Testing of Seeds Order, 1917 1031
Waste of Food Stuffs Order, 1918 1476
Wheat, Barley and Oats (Prices) Order, 1917 237, 366
,, (Channel Islands and Isle of Man Export) Order, 1917 ... 779
,, Rye and Rice (Restriction) Order, 1917 236
,, (Seed) Order, 1918 1299
Winter Beans Order, 1917 584
Cancellation of 917
Winter Milk Prices... 110
Winter Oats and Rye (Restriction) Order, 1917 583
Cancellation of 917
Wool (Off-sorts) Order, 1917 777
Stallions, see *Live Stock—Horses.*
Steam tackle, increased use of 1288

PAGE
Steuart, D. W.: Experiments with pepsin to replace rennet 57, 313
Stoke Newington allotments under the Cultivation of Lands Order ... 556
Storage of vegetables for winter use 840
Straw, utilisation of 364, 754
Strawberries, see *Fruit*.
Sugar beet: Experimental production 1100, 1485
Feeding to stock 784
Syrup from 1002
Sulphate of ammonia, see *Manures*.
Sunflower cultivation; how to get seed 1467
Supplies Sub-Committees, see *Food Production*.
Supply of horses in charge of ploughmen 896
Sutherland, M.: Forestry work for women 60
Swedes (Prices) Order, 1917, the 111
Syrup for bees 116
Syrup from sugar beet 1002

Tenancies:
Determination of tenancies where the Board have taken possession of land 459
Effect of ploughing grass land on covenants 1287
Raising of rents to be regulated by the Government 7, 114
Testing of seeds for farmers at the Official Seed-Testing Station 705, 783, 925, 937, 1031, 1070, 1202
Timber, see *Forestry*.
Tithe, Copyhold, Inclosure and other Acts, revised fees 374
,, Payment on lands cultivated by Executive Committees 374
,, Proceedings in 1916 under the Tithe Acts 537
Todd, A.: Experiments on the preparation of home-made rennet ... 307
Tractors, see *Machinery*.
Treasury Grants for cold storage 1331

United States: Accredited farms in 943
Agricultural legislation in... 880
Urmston and District Allotments Association 429

Vegetables (see also *Specific Crops* and *Statutory Rules and Orders*):
Canning, bottling and drying, see *Fruit*.
Celery, cultivation of 1296
Cultivation of peas with potatoes 752
Economy in the use of vegetable seeds 713
Glass jars for bottling, see *Fruit*.
Leek, cultivation of 66
Onion cultivation and storage 841, 1378, 1466
Peas, protection of, from birds and mice 208
Shallots, storage of, for winter use 841
Storage for winter use 840
Vetches for silage 165, 181

Wages Boards, see *Agricultural Wages Board*.
Wages: Measures in the Corn Production Act, 1917 621
Wale, B. N.: The value of cider apples and pomace as food for farm stock 530
War-time Profits: Farming *v.* Forestry 63
Wasps, destruction of 370
Weather forecasts, see *Harvest Weather Forecasts*.
Weeds:
Buried weed seeds 299
Effect of, upon crops 1394
Poisoning of cattle by ragwort 433
State action for the eradication of weeds 705
Suppression of weeds by silage crops 167
Thistles in corn 328
West Bridgford Allotment Holders' Association 883
West Midland Farmers' Association 337

	PAGE
Wheat :	
Management of thin crop in spring	179
Orders dealing with wheat, see *Statutory Rules and Orders.*	
Supplies of seed for autumn sowing	468, 469
Supply of No. 1 Manitoba wheat for seed purposes	1468
Wheat needs : How Canada can increase supplies	1300
Wild birds eggs	1238
Wintering lambs on turnips	634
Wire netting to be obtained for crop protection or sheep netting ...	253
Women :	
Cheap railway fares	482
Country crèches	1001
Forestry work	60
Minimum wage for women's land army	1486
Need for workers on the land, the	105
Mr. Prothero's appeal for woman labour on the land	468
Recruiting of land women	244, 245, 786, 1273
Test meeting at Edgbaston	785
Test meetings in Warwickshire	691
Testing farm workers	691, 881
Tractor drivers	923
Training of forewomen for planting forest trees	1043
Women on the land, the	468, 1271, 1449
,, potato harvesters	1272
,, threshers	999
Wool :	
Control of sheep and lamb pelts	248
Purchase by Government of 1917 clip	246
Sale of Wool Order, 1917	247, 474
Statutory Orders dealing with wool, see *Statutory Rules and Orders.*	
Workmen's Compensation (War Addition) Act, 1917	922
Wormald, H. : The blossom wilt and canker disease of apple trees ...	504
Wyllie, J. : The determination of the cost of production of farm crops ...	403

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AGRICULTURAL RECONSTRUCTION.

In August, 1916, the Prime Minister appointed a Sub-Committee of the Reconstruction Committee, with the following terms of reference: "Having regard to the need of increasing home-grown food supplies in the interest of national security, to consider and report upon the method of effecting such increase." In November, Lord Crawford, the late President of the Board of Agriculture and Fisheries, asked the Agricultural Policy Sub-Committee (as it was called) to consider the propriety of making an interim report upon those aspects of the question which require legislation,* and a Report [Cd. 8506, 3*d.*], which forms the subject of the present article, was submitted in reply at the end of January, 1917.

Need for a New Agricultural Policy.—The Sub-Committee say that by the adoption of a complete policy by the State, and by consistent persistence in it, a large proportion of the foodstuffs imported into this country could be produced in the United Kingdom, and a large addition might be made to the production of cereals and potatoes, not only without a diminution of the production of milk and meat but with an actual accompanying increase of that production.

While in the normal development of agricultural practice considerable increases in agricultural output would result from education, better varieties of seed, greater diffusion of good stock and improved manuring, the results would take time and be limited in degree; and since very substantial increases are essential a bolder policy is required.

The Sub-Committee state their policy in the following words: "The general average of farming must be steadily "and continuously raised throughout the United Kingdom;

* Various legislative provisions designed to carry into effect the Government's agricultural policy are before Parliament as the "Corn Production Bill."

"the grass land and the arable land alike must be more intensively cultivated; the improvement of live stock, for which landowners and farmers have done so much even through the years of acute depression, must be progressive; much grass land must be reconverted into arable; the sugar beet industry and the manufacture of potato products can be introduced into British agriculture to its great advantage; estates must be managed with a single eye to maximum production; capital must be attracted to the industrial equipment and improvement of the land and to the operations of intensive farming; agricultural labourers must be provided with an adequate supply of good cottages; small holdings, both of owners and of occupiers, must be fostered to provide a 'ladder' for the agricultural labourer and for the demobilised sailors and soldiers; the organisation of agriculture must be developed; the country must be permeated with a complete system of agricultural education; the status of the departments of agriculture must be improved and their powers enlarged and reinforced by association with existing agricultural and administrative bodies, both national and local. . . . A basis of security and stability of the conditions under which agriculture is to be carried out in the future must be the foundation of the whole structure, and without it the increase of production cannot be realised."

In the first place the Sub-Committee recommend that the State should fix a minimum wage for the ordinary agricultural labourer in each county, and in the second place guarantee to the farmer a minimum price for wheat and oats. As there is probably no land in the British Islands which can grow neither wheat nor oats but can grow barley, the Sub-Committee consider that arable farming will be sufficiently safe-guarded without a guaranteed price for barley. With regard to a tariff the Sub-Committee record their opinion that, if the State, for reasons of general policy, were to adopt a tariff on manufactured goods, then a tariff corresponding in degree (with the necessary differentiations between the products of the Empire, of allied, and of other countries) should be imposed on imported foodstuffs such as dairy produce, meat, and corn, and that special consideration should be shown to the produce of the more intensive forms of agriculture (of which fruit and hops and flax may be cited as examples) where the capital invested, and the annual expenditure in cultivation, and the proportion of that expenditure on labour, are particularly large.

Agricultural Wages.—*Formation of Wage Boards.*—The Sub-Committee recommend that Wage Boards should be set

up for each administrative county in Great Britain; or, if they thought it desirable, after consulting local opinion, the Government Departments concerned (which in this case should be the Boards of Agriculture) might constitute one Board for two or more administrative counties or for parts of two or more counties. It is considered that every opportunity should be given for Wage Boards in neighbouring counties to confer together, and, if they think fit, to submit joint reports. On the other hand each Board should be authorised to make different recommendations for different parts of its area, if it thinks it desirable. In some counties the wages generally paid would no doubt be found to be equal to, or more than, the minimum fixed by the Wage Board, and in these cases it would only be necessary to ensure that individual farmers did not continue to pay less than the approved minimum.

Constitution of Wage Boards.—The Wage Boards should consist of equal numbers of representatives of the agricultural employers and labourers in the area (say ten of each), with a smaller number of members (say six) appointed by the Agricultural Department concerned, by which also the chairman would, in each case, be nominated. Some of the "appointed members" and the chairman might be common to a group of Wage Boards, so that they might, in the course of time, gain wide experience of the problems to be solved, and the way in which their solution could most easily be achieved. The remaining appointed members on each Board might be persons familiar with the county, including landowners and agents. The selection of the workers' representatives will, in the agricultural industry, where the labourers are in most parts unorganised, present some difficulty; but the same difficulty has been encountered and overcome by the Board of Trade in setting up some of the existing Trade Boards, and in many, and an increasing number of cases, the workers prefer that the Board of Trade should, after inquiry, nominate their representatives rather than that they should be asked themselves to elect them.

Functions of the Wage Board.—The duty of a Wage Board should be to report to the Agricultural Department concerned that a certain weekly wage should be adopted as the minimum for ordinary agricultural labourers throughout the whole of its district, or, as already indicated, differing minima for different parts of its district. The Agricultural Department should have power to adopt the rate suggested and to give it statutory effect and to promulgate it, or to remit its report to

the Wage Board for further consideration. After the rate had been promulgated, and a certain interval (say three months) had elapsed, it should become illegal for any farmer in that area to pay any workmen employed by time (unless he were specially exempted on account of age or infirmity) a lower wage than the approved minimum. It would not be possible for Wage Boards in all cases to fix the rates for harvest work or for piece work, because they have often to be varied according to the weather, the soil and the state of the crop. But it follows necessarily from the establishment of a minimum wage that the rates agreed upon between the farmers and labourers must be such as will enable an ordinary labourer doing an ordinary week's work to earn at least the legal minimum wage. An old or infirm man should be paid at the general piece rate, but might earn less than the legal minimum owing to his age or infirmity. Arrangements should be made for old, infirm, and disabled workmen, of whom there are relatively large numbers employed on the land, and for women and boys being paid less than the minimum time rate fixed for ordinary labourers.

The Agricultural Departments should do everything in their power to check any tendency on the part of the farmers to reduce their permanent staffs, and rely more than they do at present on securing occasional employees during the busy seasons, and so avoiding paying the minimum wage during the winter months and during spells of bad weather.

Payments in Kind and Cottage Rents.—The earnings of agricultural labourers in all parts of the United Kingdom, but more notably in certain districts, include payments in kind. Often it would not be to the advantage of the agricultural labourer if the effect of minimum wage legislation were to encourage farmers to convert these payments into cash, and the Sub-Committee think the Wage Boards should be cautious in dealing with these allowances. The Boards might be required to include in their schemes for fixing a minimum wage a scale by which any allowances in respect of milk, meal, etc., which are made to employees according to local custom, could be valued as part of the total earnings. The Sub-Committee are of opinion that the difficulty of assessing the value of allowances in kind in agricultural industry will not be beyond the capacity of the agricultural Wage Boards.

With regard to cottages, the Sub-Committee hope that an establishment of a minimum wage will gradually lead to the abandonment of the system by which an agricultural labourer receives part of his emoluments in the shape of a low-rented

cottage, and they look forward to the time when every agricultural labourer who rents a cottage will pay the full economic rent, and rates, and receive such wages in cash as will enable him to do so. Since, however, for some time to come large numbers of farm servants will continue to live in cottages let to them at rents which are uneconomic, the Sub-Committee consider that in fixing minimum rates of wages, the Wage Boards should be required to calculate for a full economic rent for a good cottage being paid by the workman, and should fix the maximum amount which a farmer would be entitled to deduct from agricultural wages for such rent. In the event of a workman being housed in an inferior cottage, he would be in a position to claim a reduction in rent, and thus be compensated for his inferior accommodation by receiving a larger cash wage.

In view of the extraordinary divergence of conditions in different parts of Great Britain, and of the fact that agricultural wages are still rising, and of the unknown factor of the comparative values which will exist on the declaration of peace, the Sub-Committee disclaim the task of fixing any specific figure for a minimum wage.

Price of Wheat and Oats.—The lowest figure at which in the opinion of the Sub-Committee a guaranteed minimum price would be likely to give farmers a reasonable security against loss in growing wheat is 42*s.* per qr., and in growing oats 23*s.* per qr. These recommendations are necessarily made without certain knowledge of what will be the standard of values after the War. No period for the duration of this guarantee is suggested, because in the opinion of the Sub-Committee it can never be compatible with national security, so long as wars are possible, to deprive agriculture of the stability of cereal prices. The Sub-Committee suggest an initiatory increase of the guarantee in the first two years after the declaration of peace, their belief being that the impetus which this temporary additional guarantee will give to the policy of the plough will be well worth the risk of a temporary additional charge, should there be a drop in the after-war cereal prices.

Method of Payment under the Guarantee.—The Sub-Committee agree with the recommendation of Lord Milner's Committee, viz., that the farmer should receive the difference between the guaranteed price of a quarter of wheat (480 lb.) or of a quarter of oats (312 lb.) and the "Gazette" average price for the year in which the crop is harvested.

This system has the advantage that it leaves the grower free to dispose of his crop when he wishes in the open market, and that the State action in guaranteeing a minimum price to the farmer does not raise the cost of the produce to the consumer. At the same time the farmer is able to benefit by improvement in the quality of his produce, and by taking advantage of any fluctuations in the market price.

The Sub-Committee regard it as essential that payment should be based on (*a*) the number of quarters actually harvested, so far as this can be estimated, not on the number of acres sown, and (*b*) the whole of the farmer's production regardless of the amount consumed on the farm.

They recommend that every farmer who desires to claim the benefit of the guarantee should be required either :—

(*a*) To use a threshing machine which has been duly licensed for hire, the firm to which the machine belongs being made responsible for providing the farmer with a true certificate of the number of quarters of corn of the required weight threshed ; or

(*b*) If he does not propose to use a hired machine, to give notice to that effect to the Board or Department of Agriculture some time before harvest in order that the yield of his standing crop may be estimated by a Government valuer whose fees and expenses he should repay to the Board or Department of Agriculture. If he considered that the crop had been under-estimated he could still have resort to the test of a public threshing machine.

Any farmer desiring to claim the benefit of the guarantee should send in his certificates of threshing, or the estimate of the Government valuer, to the Board or Department of Agriculture, by which they should be checked and the sum found due be paid to the farmer.

An alternative plan which, in the long run, might easily be the cheapest, might be adopted in the place of (*b*). The Board or Department of Agriculture might, under carefully devised regulations, accept the certificate of the farmer as to the amount of wheat or oats which he had threshed on any given day when he had obtained the counter signature of some official or person of repute resident in the parish and authorised for that purpose by the Board or Department of Agriculture. If the officials of the Board or Department of Agriculture checked the threshing returns sent in by the farmers with their crop returns, and if they had the right of access, as they should have, at any time to the farm and farm premises of any farmer claiming the benefit of the guarantee, it is probable that they would soon become aware, from information acquired in the ordinary

discharge of their duties, of the existence of fraud, the penalty for conviction for which should be very severe.

Effect of Guaranteed Prices on Rents.—The Sub-Committee next turn to the examination of the questions of adjusted rents and fixity of tenure. They decide against both of these. They argue (1) that the landowner finds capital as well as the farmer, and it is fair that he should get a share of any benefits resulting from a more profitable agriculture. (2) Where an uneconomic rent is paid, to secure the present occupiers in their tenure would be to make them a present of that part of the real value of the land for which the owner is not demanding a return in the shape of rent. The experience of the Sub-Committee does not lead them to expect that the average occupier would respond to such a gift by any intensification of his farming, or by increased production. Low rents have too often resulted in slack farming, and to secure the farmer in those rents would in such cases only leave him content with his unprogressive methods. (3) It will be highly desirable to attract to agriculture after the War an uninterrupted flow of capital. The rent which the landowner receives rarely represents an interest of as much as 5 per cent. on the capital invested in the industrial equipment of the land, and this includes no interest whatever on the capital value of the land itself. This is not to the advantage of agriculture or of the State, because it acts as a constant deterrent to the investment of capital in agriculture. Again, no prudent landowner would sell out stock from which a return of interest is assured, and reinvest his capital in the industrial equipment of the land, if he ran the risk of losing the whole or part of the interest which he was expecting to receive from it, by the decision of a Land Court. (4) Lastly, the Sub-Committee point out that the State would be creating a whole field of fresh difficulty and complication for itself if it inaugurated its new agricultural policy by conferring on the farmers a legal vested interest as part proprietors of their farms. If by the establishment of a Land Court a system of dual ownership in any degree were created, the State would have to deal in respect of the responsibilities of ownership with all the tenant farmers as well as with all the agricultural landowners.

Method of Securing Increased Production.—It is urged that the State must give time to all concerned to adjust themselves to the new conditions dictated by considerations of national safety, and must take every means in its power to give confidence and a sense of stability to all landowners, farmers, and

agricultural labourers. The standard set before the eyes of these classes should be the highest—not to be content until the whole of the soil of the United Kingdom is producing the greatest possible return of foodstuffs or of timber. It must be clearly understood that henceforth bad farming is a danger to the State, and that the waste of good land on game or games is inconsistent with patriotism. There will be plenty of room for game or golf in moderation, but too much game, or golf links carved out of fat land, make an inroad on the production of foodstuffs which can no longer be defended. Rabbits must be recognised to be what they are—a curse to both agriculture and forestry.

When all this has been explained to them, it is advocated that landowners and farmers should be informed that they will be given reasonable opportunity to adjust themselves to the new conditions. The agricultural labourers being secured their share of profits by the institution of a minimum wage, the landowners and the farmers may be left to adjust their shares between them, and also to come to an agreement (which is essential) about the relaxation of covenants against the ploughing of grass land or of any others which tend to discourage good farming.

Survey of Agriculture.—The Sub-Committee recommend that the Boards and Department of Agriculture should be instructed to carry out a general survey of the conditions of agriculture throughout the United Kingdom, and that the utmost care should be exercised in selecting those who are to undertake the work. They recommend further that a panel of assessors should be set up for groups of counties in England and Wales, and that there should be constituted for England and Wales separately a Review Committee consisting in each case of three persons, the greatest authorities on agriculture and estate management obtainable, who should be empowered to take legal advice if necessary.

Powers as regards Landowners.—The Sub-Committee recommend that if, in the course of survey, it appeared to the Board of Agriculture that land (other than a public or private garden or park) was, from any cause, not being fully utilised for the production of foodstuffs or timber, notice should be served upon the owner of the land by the Board of Agriculture to the effect that if, after an interval of three years from the date of notice, the position was still unsatisfactory, the case would be referred to assessors. If, at the end of these three years, evidence was not forthcoming of substantial improvement, the case should

be referred to the panel of assessors for the area, who should select three of their members not resident in that county to examine and report upon it. They should be required to inspect the farm or estate personally and to hear everything that the owner, or agent, or tenant, or any witness whose evidence they thought material to the case, had to say. But no counsel or solicitor should be permitted to appear professionally before them, nor should any costs be allowed. On receiving the report of the assessors the Board of Agriculture should refer it to the Review Committee, whose function it would be either to recommend the adoption of the report or to order a supplementary or, if necessary, a new report. The Committee should not re-hear the case or act in any way as a court of appeal, but merely consider and review the report. If the report, as passed by the Committee, was adverse to the general management of the estate, and showed that good farming was being discouraged or impeded, or bad farming treated with too much leniency, or that, for any other reason, the estate was not making the contribution which it could reasonably be expected to make to the production of foodstuffs, it is recommended that the Board of Agriculture should be empowered temporarily to supersede the landowner in the management of the estate, for all purposes essential to agriculture.

When once the management of an estate had been so taken over by the Board of Agriculture, it should retain that management for five years, unless within that period there had been a successor in title to the original owner, in which case the estate should be handed back to his management at the end of the current farming year, if he so desired it and was prepared to accept such liabilities as may have been incurred in connection with it. If there had been no change of ownership within that period, the Board of Agriculture should be empowered to hand back the estate to the original owner at its termination if it was satisfied that the future management of the estate would be satisfactory.

If it were not so satisfied, then it would continue to manage the estate for another quinquennial period, and so on from five years to five years, until there had been a change of ownership.

The owner should, throughout, be undisturbed in the exercise of sporting rights over the estate, subject to the power of the manager of the estate to prevent those sporting rights being exercised in a manner detrimental to agriculture or forestry. If the owner of such an estate is unable or unwilling to develop

it for the purpose of agricultural production, the Board of Agriculture should have the power to borrow from the Land Commissioners and to develop it for that purpose by the expenditure of capital, the charges for which (interest and sinking fund) should have priority over all existing charges on the land charged according to the principle embodied in the Improvement of Land Act, 1864. During the period of supersession the power of the owner to make any fresh charges on the estate, or part of the estate, should be suspended, and the existing charges on it, whether by way of mortgage or of settlement, should be paid out of the proceeds of the land by the Board of Agriculture.

Powers as regards Tenants.—It should be laid down, say the Sub-Committee, that it shall be the duty of every landowner so to manage his estate, and that it shall be an implied condition in every lease or tenancy agreement, that the tenant of agricultural land shall cultivate the same according to the approved practice of the best agriculture, with a view to the economic production in the interests of the community of the greatest amount of foodstuffs (for man or beast) of which the land, having regard to its quality and position, is reasonably capable.

Where land is being badly farmed by a tenant who holds a lease, and who persists in farming badly after being duly warned of the ultimate consequences, the landowner may bring the case before the Board of Agriculture, at the same time giving formal notice of his action to the tenant. The Board should thereupon ask the local panel to appoint assessors, resident in another county than that in which the farm is situated, to report upon the farm, and in due course should refer their report to the Review Committee. If, as the result of the unfavourable nature of the report in respect of the farming of the land, the Review Committee so recommended, then the Board of Agriculture should be empowered to call upon the landowner to give twelve months' notice to the tenant to quit, and that notice should have effect as if the tenant had held no lease, but was a tenant holding on a yearly agreement.

Cottages.—The Sub-Committee strongly insist that there can be no hope of a satisfactory development of agriculture, as long as the demand for cottages remains unsatisfied, and that the provision of cottages should be taken in hand without a moment's avoidable delay after the War.

Sugar Beet.—The Sub-Committee attach great importance to the establishment of the sugar beet industry, and they urge the Government to arrange without further delay for a complete test of the commercial possibilities of manufacturing sugar from home-grown beet. They hope that the test will prove that a considerable proportion of the sugar we consume can be grown in the United Kingdom, and that the introduction of the beet crop into the rotation will increase the yield of the other crops. In short, the Sub-Committee believe that it will prove that the introduction of the sugar-beet industry will be a contribution of much importance to the increased production of foodstuffs in the United Kingdom.

REPORT ON HUMOGEN.*

E. J. RUSSELL, D.Sc.,

Director of the Rothamsted Experimental Station.

HUMOGEN is the name given to a preparation of peat invented by Professor W. B. Bottomley, of King's College, London, for which high manurial value has been claimed. The substance is prepared by neutralising the peat and then causing it to undergo bacterial decomposition up to a certain point, after which the mass is sterilised and inoculated with a culture of nitrogen-fixing organisms.

Survey of Previous Experiments.—Experiments made at Kew with plants in pots gave extraordinary results, suggesting that humogen had some positive, definite action on plant growth. These experiments have been several times described, so that no further account is necessary. The humogen was used at the rate of 1 part to 7 or 8 parts of soil by volume, a quantity that is quite feasible in pot work, but out of the question for agriculture.† Pot experiments with these large amounts were also made at Wisley, and definite increases in growth were obtained which, while in no way sensational, showed that the material is of value to the horticulturist growing plants in pots where economic considerations do not come in. This result is quite intelligible; the addition of so large an amount of organic

* See Editorial Note, pp. 12–13.

† No weighings seem to have been made, but, taking the ordinary specific gravity values, the dressing of humogen in these experiments probably amounted to some 30 to 50 tons per acre.

matter in so fine a condition as humogen could hardly fail to have a good effect on the soil in a pot, while the large amount of nitrogen thus introduced adds to the supply available to the plant.

Other experiments, however, led Professor Bottomley to believe that such large quantities were not necessary and that much smaller amounts would give equally good results. In a paper read before the Royal Society in 1914 he claimed that an extract of this humogen had remarkable stimulating effects on the growth of plants, which he considered to be analogous to those obtained by Hopkins and others with the so-called accessory bodies; he therefore supposed that some of these were present, and he gave them the name "auximones." Further, he stated that the auximone could be isolated by precipitation with phospho-tungstic acid, and he obtained in this way a concentrated stimulant which was said to cause remarkable increases in plant growth.

The purpose of our investigations at Rothamsted was to ascertain whether humogen possesses the value for agriculture which the Kew experiments indicated for horticulture. Claims of the most extensive kind had been made; serious journals had printed statements to the effect that the use of humogen

EDITORIAL NOTE.—A proof of the report of these experiments by Dr. Russell was sent to **Professor Bottomley,** who writes as follows:—"The results obtained last year by Dr. Russell are not surprising in view of the fact that late last autumn I discovered that the material sent to Dr. Russell, both from Entwistle and Manchester, was not *bacterial* peat but a *chemically treated* peat, which contained substances injurious to plant growth. Most unfortunately, there was a serious error in the manufacture of the early lots of humogen sent out from both places. Briefly, what happened was as follows:—At both places work was not commenced until late in March; the machinery available was most inadequate, and the wet peat, as cut from the bog, had to be used at once, without any preliminary aeration or drying.

"In the process of manufacture a small amount of sodium carbonate (½ to 1 per cent.) is mixed with the raw peat, sufficient to neutralise the acidity without producing a soluble humate, before incubating with the aerobic decomposition organisms. In the original manufacture of humogen at Greenford, the depth of colour of the water extract obtained after incubation with these organisms was used as a guide to the effectiveness of the bacterial decomposition of the peat, and incubation was allowed to continue until a dark coloured extract was obtained.

"As humogen was wanted as quickly as possible last spring for experimental work in order not to miss the season, it appears that those in charge of the works, well knowing the solvent action of alkalies on peat humus, added an excess of sodium carbonate to the raw peat—in some cases as much as 6 per cent.—in order to obtain quickly a soluble humus, and thus, as believed, obviate the necessity for a lengthy period of incubation. This was contrary to my definite instructions as to quantities and time for incubation. The result was that a chemically-treated peat, containing an excess of soda, was sent out instead of a properly bacterised peat.

"I had no suspicion that anything was wrong with the early lots sent out until I heard from Messrs. Sutton, of Reading, that their experiments with the material were showing that it contained something which actually checked plant growth, and as this was contrary to what they had anticipated, after

might be expected to "double the food production of the country"; some went a little further and spoke of trebling it.

When, however, the basis of these various statements was examined it was found to be somewhat slender, and to consist mainly of testimonials which, as every agricultural investigator is aware, always seem to be forthcoming whenever a new fertiliser is brought before the public. The trials made at the regular agricultural institutions had in the main given negative results, and there was practically no evidence of agricultural value to which exception could not be taken.

The Woburn pot experiments* with several crops had given increases when the material was used at the rate of 18 or 36 tons per acre; but as the material is offered at £6 or £7 per ton the cost of such dressings would be prohibitive. Outdoor experiments with applications at the rate of 5 cwt. per acre gave only small results.

The Wisley experiments† made out of doors with turnips gave disappointing results which in no sense bore out the claim that humogen contained "50 times as much plant food as farmyard manure"; 1 ton of humogen gave smaller yields than 20 tons of farmyard manure.

seeing the results obtained at Kew Gardens in previous years, they wanted to know the reason. For some time I could obtain no clue, for each time I visited the works everything appeared to be in accordance with my directions, and it was not until September that I was able to locate definitely the cause of the trouble.

"It was impossible, owing to my College duties in London, for me to be present at Entwistle and Manchester when the first lots were being manufactured, hence, I had to depend on other people for my instructions being carried out.

"Although the error was beyond my control, I deeply regret that the time and labour involved in the Rothamsted experiments should have been expended on testing a substance which was not humogen.

"That the material sent to Rothamsted was not properly prepared is evident from the negative results obtained by Miss Brenchley with water cultures. In every other case of water culture experiments with properly bacterised peat, including those carried out under the supervision of Professor V. H. Blackman at the Imperial College of Science, South Kensington, and which were seen by representatives of your Board, water extracts of bacterised peat have given remarkable results. These results will be published by the Royal Society, and a résumé of them will be given in a later issue of this *Journal*."

Dr. Russell states that the material was sent to him in May, 1916, as true humogen; it was not purchased unknown to the vendors; and Professor Bottomley, the Cleansing Department of the Manchester Corporation, and the Entwistle firm, all knew that it was for the purpose of these trials. Neither then, nor in any subsequent correspondence, nor on the occasion of Dr. Russell's visit to the works at the end of August was there any hint that the material was defective, and the first intimation to this effect was a letter from Professor Bottomley to Dr. Russell on 17th March, after proofs of the present report had been submitted to Professor Bottomley.

* *Jour. Roy. Agric Soc.*, 1915, 76.

† *Jour. Roy. Hort. Soc.*, 1916, 41, 305–326.

Experiments at the Midland Agricultural College also gave negative results.*

More positive results appear to have been obtained at Sparsholt,† but the published data are not sufficient to justify detailed discussion. Seven varieties of potatoes were grown; two, King Edward VII. and Golden Wonder, gave large increases in crop with humogen, while five gave smaller increases of about 20 to 30 per cent.

The basal dressing was 1 cwt. of sulphate of ammonia and 2 cwt. of superphosphate; the amount of humogen added is not stated; the trial was of "humogen basal dressing" against "basal dressing alone," and no comparison was set up between humogen and farmyard manure.

The results were :—

Variety.	Unsprayed.				Sprayed twice (early and late in July).				Sprayed twice and dressed with "Humogen."			
	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.	tons	cwt.	qr.	lb.
British Queen* ..	4	19	2	11	9	0	3	6	12	12	1	8
King Edward VII. ..	3	16	1	10	4	16	1	20	9	1	2	12
Up-to-date	7	11	3	14	9	17	2	20	11	8	3	20
Arran's Hope	7	9	1	24	8	12	3	2	10	8	3	20
Arran's Chief	5	10	3	16	7	7	0	6	9	0	0	0
Golden Wonder ..	4	16	1	20	5	8	1	26	10	7	1	8
Langworthy	3	19	0	17	5	4	1	24	5	12	2	0

* The seed was all one-year from Scotland, except that of British Queen, which was direct from Scotland that season.

As the plots were not duplicated it is impossible to say what degree of significance the results possess.

Other experiments at Sparsholt made with tomatoes also led to increased yields; but in experiments with peas, broad beans, dwarf beans, carrots, beets, parsnips, celery, leeks, currants, gooseberries, raspberries, strawberries, apples, pears and plums, none of these "were affected in the least."

A series of tests with tomatoes and cucumbers made at the Lea Valley Experiment Station‡ gave wholly negative results.

The Rothamsted Experiments.—The Rothamsted experiments were undertaken at the request of the Board of Agriculture in 1915. Professor Bottomley gave full information of sources

* Rept., Midland Agric. and Dairy Coll., 1915, pp. 33–35.
† Report on Potato Expts., Sparsholt, Winchester, 1915.
‡ First Ann. Rept., Expt. and Research Station, Turner's Hill, Cheshunt 1915.

of material, methods, etc., and arranged at a later date for a visit to the Works at Manchester and at Entwistle. Unfortunately the supply of humogen was not available till the end of May, 1916, and the experimental test was therefore less extensive than had been intended. Of four major tests designed, three were carried out satisfactorily, but the fourth with mangolds at Rothamsted was so delayed that it is not desired to attach much significance to it. The results of all the experiments, however, are in agreement.

In order to eliminate local influences of soil, climate, etc., the experiment was carried out partly at Rothamsted, and partly at the Harper Adams Agricultural College under Principal P. H. Foulkes. The experiment was designed to show the effect of humogen by itself, and in conjunction with farmyard manure, and with farmyard manure and artificials; the last being intended to show whether humogen has any stimulating effect that will help the plant to make better use of the foods already supplied.

Two sorts of humogen were used; one coming from Manchester being prepared by the Cleansing Department from peat excavated on Chat Moss, and the other from Entwistle being prepared by the Entwistle Mountain Peat Estate Company, from the peat overlying deposits of limestone.

In all cases the results were negative; the humogen had no effect.

The usual dressing was 10 cwt. per acre, this quantity being suggested by Professor Bottomley as being likely to bring out the value of the humogen.

Harper Adams Agricultural College.—The results with wheat at the Harper Adams College were:—

	Yield per acre.		*Total value of Grain and Straw.*
	Grain.	*Straw.*	£ s. d.
Humogen, 5 cwt.	46½ bush.	38½ cwt.	26 14 0
No dressing	47¼ ,,	45¼ ,,	28 6 3

If the humogen had any effect at all it was slightly to depress the crop.

Mangolds.—The results with mangolds were:—

Results in combination with Dung and Artificials.

	With Nitrate.	*Without Nitrate.*
	tons. cwt. qr.	tons. cwt. qr.
*Humogen, 5 cwt. per acre	24 15 3	25 18 0
* ,, 10 ,, ,,	27 13 1	28 13 0
† ,, 10 ,, ,,	25 7 0	29 5 0
No humogen	28 0 0	28 1 1

* Entwistle. † Manchester.

Results with Artificials only. No Dung.

	With Nitrogen.			Without Nitrogen.		
	tons.	cwt.	qr.	tons.	cwt.	qr.
*Humogen, 5 cwt. per acre ..	22	0	3 ..		—	
* ,, 10 ,, ,, ..	23	2	3 ..	20	2	0
† ,, 10 ,, ,, ..	26	11	0 ..	25	18	1
No humogen	22	5	2 ..	23	3	0
Ordinary peat, 5 cwt. per acre ..	27	5	3 ..		—	
,, 10 ,, ,, ..	28	18	2 ..		—	

Results without Dung or Artificials.

	tons.	cwt.	qr.
*Humogen, 5 cwt. per acre	19	18	1
* ,, 10 ,, ,, ...	19	15	2
† ,, 10 ,, ,, ...	18	10	3
No humogen	17	16	2
Ordinary peat, 5 cwt. per acre	19	5	3

* Entwistle. † Manchester.

In one or two cases where there has been no dung the humogen has somewhat increased the crop, notably when 10 cwt. of Manchester humogen were applied with artificials and nitrate; 10 cwt. of untreated peat, however, gave a still larger increase. The untreated peat was from Westmorland and not from Entwistle, but the result does not suggest that bacterisation has effected any very radical change. There seems no reason to assume any very special fertilising action beyond the well-known power possessed by finely divided peat of holding moisture.

Assuming the difference to be real, the 10 cwt. of untreated peat have given an additional $6\frac{1}{2}$ tons of mangolds, while the 10 cwt. of Manchester bacterised peat have given $4\frac{1}{4}$ tons. On the other hand, the Entwistle bacterised peat has given only 17 cwt. additional crop, a quantity to which no significance can be attached as it lies within the error of experiment. If the result means anything, it is that there is no more difference between the two samples of humogen than between humogen and untreated peat.

Garden Crops.—A further series of experiments was made on a smaller scale with garden crops. Only in the case of peas and potatoes was any increase obtained as a result of using humogen; the other crops, beans and cauliflowers, were actually depressed. Taking the results as a whole and allowing for the rather large error inseparable from garden crops, one may conclude that they show no increase as the result of applying humogen.

	Peas. lb.	*Beans.* lb.	*Cauli-flower.* lb.	*Potatoes.* lb.	*Total.* lb.
Humogen, 1 ton per acre..	29½	21½	20	24	95
,, 2 tons ,, ..	33	19	26	18	96
,, 1 ton ,, and complete artificials	36	17½	19	14	86½
Ordinary peat	28	28	26½	20	102½
No dressing	27	24	33	15	99

Rothamsted Experimental Station.—*Mangolds.* — Owing to the circumstance that the humogen was not delivered till the end of May, the Rothamsted experiments with mangolds are not so satisfactory as those at the Harper Adams College. The lateness of sowing caused the plants to be badly affected by drought; plants on the humogen plots suffered at least as much as the rest. The results of the experiment are :—

	Plot.	*No. of Plants in Plot.* ($\frac{1}{10}$ acre.)	*Yield per acre.* Tons.
No manure	6	651	4·0
Manchester humogen only ..	1	518	2·8
Entwistle humogen only	11	603	3·5
Artificials only	7	899	5·4
Manchester humogen + artificials..	2	793	4·9
Entwistle humogen + artificials ..	12	813	6·5
Dung and artificials only	10	926	9·6
Manchester humogen + dung and artificials	5	766	8·5
Entwistle humogen + dung and artificials	15	1,200	13·4

None of these crops is good, the drought having depressed them all considerably.

In one place the humogen appears to have had a good effect, but there is evidence that this is not real. Adjoining Plots 10 and 15 were two others (Plots 17 and 16) receiving complete manure, but no humogen; though treated exactly alike their yields were 11·2 and 16·5 tons, respectively, *i.e.*, the two plots were under identical treatment, and yet gave exactly the same differences as the two plots, one of which received humogen while the other did not. It is therefore not permissible to attribute the difference in yield to the humogen, but rather to a local difference between Plots 10 and 17 on the one hand, and Plots 15 and 16 on the other. Such local differences come out very strongly in periods of drought, and for that reason late experiments rarely give satisfactory results.

Thus the field experiments are uniformly negative. They show no special fertilising effect, and in the only cases where increases were produced they were no better than were obtained from untreated peat.

Mustard in Pots.—The pot experiments at Rothamsted were carried out under much more favourable conditions than the field experiments described above; only a small amount of humogen was wanted, and this was obtained in time. The general plan was to apply the humogen at the rate of 10 cwt. per acre, and to give it also in conjunction with a basal dressing containing potash and phosphates. Half of the controls received nitrate of soda containing nitrogen equal to that in the humogen. The crop sown was mustard, and growth was satisfactory throughout.

Again, however, the results were entirely negative and the humogen was without effect; untreated peat had at least as good an action. The figures are as follows:—

*Dry Matter Formed per Pot. Average of 6 Pots.**
Mustard.

——	Series.	No Basal Dressing.	With Basal Dressing = 10 gm. Superphosphate and 5 gm. Sulphate of Potash per Pot.	
		gm.	gm.	
No humogen	1	12·86	15·91	——
Entwistle humogen ..	2	13·015	16·86	5 gm. humogen per pot.
Manchester humogen..	3	13·00	17·59	5 ,, ,, ,,
Hambledon peat ..	4	13·34	17·20	5 ,, ,, ,,
Cheshire peat.. ..	5	12·47	17·04	5 ,, ,, ,,
Sodium nitrate ..	6	—	16·36	·08 gm. per pot : equiv. N. to that in 5 gm. Entwistle peat.
Fish guano	7	—	16·50	·31 gm. per pot.

* The humogen was added at the rate of 10 cwt. per acre, or 0·05 per cent. of the weight of soil in the pots. As an equivalent dressing in series 6 nitrate of soda was added at the rate of 0·16 cwt., *i.e.*, 18 lb. per acre or 0·008 per cent. by weight of the soil in the pots. The weight of soil per pot was 10 kilog. and the basal dressing was 10 gm. superphosphate + 5 gm. sulphate of potash, these being found by experience to be suitable. The fish guano contained nitrogen equivalent to that in the Entwistle peat.

Barley in Water-Culture.—The last series of experiments was carried out by Dr. Winifred Brenchley. Professor Bottomley had obtained a 50 per cent. increase in growth of wheat in water-culture by adding some of the extract of bacterised peat. Dr. Brenchley's experiments were made with barley because this plant has certain advantages over wheat for water-cultures; the results are given on p. 19.

The plants receiving humogen were rather darker in colour than the others, but the difference in weight is less than 5 per cent., and no significance can be attached to this result.

Peas gave equally negative results.

This is in direct disagreement with Professor Bottomley's result, but it is not difficult to account for the discrepancy.

Professor Bottomley's curve looks very convincing, but the figures are less satisfactory. The average weight of his individual plants was about 0·2 gm. *fresh weight*, while that of Dr. Brenchley's plant was 11·4 gm. *dry matter*. It is quite evident that there was something wrong with his cultures, for neither the untreated plants nor those treated with humogen made normal growth; indeed, his control plants actually lost weight. The light and atmospheric conditions at King's College are probably not very good, and are certainly not so good as at Rothamsted, so that, even assuming equal skill and attention, the plants would hardly have done as well as in our laboratories. In view of the very abnormal growth at King's College the writer does not consider that there is any evidence of stimulation of growth.

Water-Cultures. Average 10 *Plants. Barley.*

Entwistle Humogen.	Weight of Dry Matter per Plant.		
	Shoot.	Root.	Total.
	gm.	gm.	gm.
No humogen (control)	9·35	1·76	11·1
Extract of ·2 gm. of humogen per plant	9·75	1·74	11·49
„ ·6 „ „ „	10·08	1·57	11·65

Summary.—Summing up the results, we find no evidence that humogen possesses any special agricultural value. There is not the least indication that it is "50 times as effective as farmyard manure," to quote an often repeated statement, and there is nothing to show that it is any better than any other organic manure with the same content of nitrogen. It is offered at present at £5 per ton in 2-ton lots; our experiments give no reason for supposing that it is worth anything like so much.

This result is in entire disagreement with the claims made on behalf of humogen, and the question naturally arises: Are those claims wholly without foundation?

In endeavouring to arrive at a solution of this question two circumstances must be taken into consideration: (1) the fact that good results were undoubtedly obtained in pot experiments both at Kew and at Wisley; and (2) the evident variability in the composition of humogen.

(1) The writer is quite prepared to believe that the horticulturists found humogen in the quantities used at Kew and at

Wisley a valuable addition to the compost used for potting up plants, but he is not prepared to say that humogen is any better than an equal amount of untreated peat in an equally fine state of division. Such finely-divided organic matter will serve several useful purposes in pots, and when it forms 12 per cent. or more of the whole bulk it is present in sufficient amount to exert a useful effect.

It is quite possible that heavy dressings would have good effects on poor soils deficient in organic matter, but they would have to be on a far larger scale than is possible at present prices.

(2) The second point to which attention should be directed is the evident variability of the samples. The analysis published in "The Spirit of the Soil," by G. D. Knox (p. 86), for which Professor Bottomley accepts responsibility, claims :—

Percentage of total nitrogen in humogen 4·310 per cent.

Rothamsted analyses on the other hand show :—

	As sent out.	*In dry matter.*
Percentage of total nitrogen in Manchester humogen	0·570 ..	1·29
Percentage of total nitrogen in Entwistle humogen	0·431 ..	1·32

Here, of course, is an enormous discrepancy. The book seems to indicate that the 4·3 per cent. of nitrogen is contained in humogen as sent out, but even if this is presumed to be an error, and the figure is taken to represent the amount in the dry matter, it is still greatly in excess of anything that we find. It must be supposed either that there has been an error in Professor Bottomley's analyses or that the two samples of humogen sent to Rothamsted were considerably poorer than the earlier samples.

Dr. Voelcker has also called attention to the variations in samples sent out, one examined by him containing 0·48 per cent. of soluble nitrogen, while another contained 0·08 per cent. only.

This variability is, of course, highly unfortunate. It is possible that some samples have acted well in the field ; it is certain that others have not. There is no definite evidence that "bacterisation" really adds to the value of peat. In the writer's view the wisest plan would be to concentrate on experimental work and stop all propagandist operations until some definite basis of incontrovertible fact has been attained. The latter point is still a long way off ; the problem of utilising peat is sufficiently difficult to occupy the whole attention of a laboratory for some years, and nothing but quiet, serious work is likely to solve it.

THE EDUCATION OF CITY BOYS ON THE LAND:

A Preliminary Inquiry.

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THE separation of interests in English domestic government between counties (chiefly agricultural) and cities (largely industrial) has led to an unfortunate situation in the educational programme: for in using farms and gardens as apparatus for education the county thinks almost wholly of educating its own people—the sons of farmers and other country folk. Such persons are materially helped by the sciences which are placed at their disposal, and it is not for a moment intended to depreciate the importance of the Agricultural College, the Ruralised Secondary School, or the Winter Continuation Classes, all of which tend to increase the economic value of the county's output, to increase the happiness of the countryman's life by enlarging his interests, and hence to keep more people *on* the land.

But were an agricultural county council asked to enlarge its scope and offer special facilities for education to the youth of cities, it would decline, the rates being already burdensome, and the county spending its money on what it believes to be the interests of its own agricultural people. The city acts in a similar manner, with rare exceptions spending its money within the city, intensifying the exclusive tastes and interests fostered by city life. Just as cotton-spinning and engineering are trades which the town of Bolton must foster and aid by its methods of schooling, so farming and kindred industries are the trades of Gloucestershire, and are the chief concern of the people of that county. This estrangement has been inevitable, but when the situation is fully thought out, it will be seen to be disastrous, since agriculture, while in one sense a trade, is from the national point of view a *mode of life*. (The widest definition is given to the term "agriculture," to include all employments *on the land*—all such as take a man chiefly into the open air). This national point of view concerns not only economics but physical and moral well-being. Agriculture is a trade, but far more than a trade: it is a fundamental asset to a wholesome national life that a goodly proportion of cheerful industrious people should be out at work living and multiplying on the countryside. All that has happened since

August, 1914, only tends to confirm this view, and it need not be enlarged upon. One piece of evidence arising out of the Derby recruiting effort may, however, be noted: the writer's own inquiries as a "canvasser" in a congested area in Manchester have appalled him, by revealing so large a proportion of men, married and single, returned as medically unfit to take up army life.

1. The inquiry discussed in this paper, therefore, starts with the axiom that the *primary function of agriculture is to produce men*: turnips and cattle are important enough, but they are only means to an end. If a sufficient supply of competent men is bred in the country, we shall not only, as now, furnish the cities with a large proportion who will "drift" thither and be used up in factories and warehouses, but we shall have enough remaining on the countryside to grow an increasing supply of agricultural produce and to keep alive a fine race of men and women. This use of land, as a nurture ground for human life, has always been acknowledged and enjoyed by those who have the means. The impulse which moves the city merchant to buy a "pleasure farm" is not the mere ostentatious display of wealth, but a sound instinct of self-preservation for his family and his class. Such men, it is true, do not wholly forsake the city, but thanks to the rapidity of modern means of communication, they can reap the benefit of both modes of life. The less fortunate classes are not so happily situated, and the conditions of national health and well-being are now so clearly displayed as to warrant the direction of public attention to this aspect of what is called "the land question."

It is clear that if agriculture is regarded from this standpoint all proposals for reform alter their aspect. The ordinary treatment of topics such as reform of land tenure, of housing or of wages, is based on the assumption that living in the country in England can be conducted with the same prospects as in Canada or New Zealand. Such reforms are not here considered: however important they may be, they are only of consequence as subsidiary to the main purpose of facilitating the maintenance of more families on the countryside.

2. The present inquiry is based on a belief that certain factors in human nature have hitherto been left out of account, and it is desirable in the national interest that these factors should be considered. Briefly stated these factors are as follows: (1) Individuals differ widely in temperament and disposition: and some find country life so congenial that they

will endure many sacrifices in order to attain it. (2) Many people of the type indicated are born in cities and often have no chance of discovering that the country is their proper home. (3) The disposition referred to in (1) is often accompanied by slight physical disability, such as nervous or throat trouble or general lack of robust development. Persons of this type are commonly of average or superior mentality, and possess a capacity for organisation superior to that of folk bred in the country. This point is important, since the lack of co-operation is notoriously one of the chief hindrances to the prosperity of country folk. (4) A change of life such as migration from town to country must be begun in youth. The attempts made by reformers like the late Joseph Fels to transplant families have been very hazardous. A countryman not only follows a different trade from the townsman, but his domestic and social habits are different, and the latter cannot easily be uprooted; if in any given family the husband adapts himself to the new position the wife perhaps cannot, or *vice versa*.

With these factors coming into play one ought to find a stream of migration from the city to the country, acting as an offset to the depopulation of the countryside. Is there any evidence that this is the case? The well-to-do are in the fortunate position of being able to make the best of both town and country. At the other end of the social scale there is no such power: when children of the labouring class once reach the city they cannot return even if they wish to do so. Between the labouring and upper classes, however, there is evidence, not statistical but quite adequate, to show that a considerable number of people every year abandon city employment to take up poultry-farming or market-gardening or allied occupations. Thousands more accept the aid of emigration societies and seek in our Dominions or the United States the kind of life which they would prefer to follow in England.

It may be concluded, therefore, that while the actual force of this stream to the English countryside is minute in comparison with the contrary stream from village to city, its *potential* force is great enough. This is important, as organisation is useless if it attempts to work contrary to natural tendencies.

3. I have therefore made some inquiries to discover what efforts are made to educate city boys over 12 years of age to fit them for rural occupations, *i.e.*, not merely to give them lessons in a school situated in the country, but to provide them

with first-hand experience of country occupations. Practical and useful employment under competent guidance often affords a better schooling than the modes of learning commonly associated with the teacher's desk. In any event, there is no danger of the three R's and the use of books being neglected at the present day, and the boys under consideration will have previously acquired the elements of primary education.

There are at present three groups of institutions which provide agricultural instruction. (*a*) The first group comprises the agricultural colleges, which are not considered here. (*b*) The second includes institutions corresponding as regards the age of the pupils to ordinary secondary schools. An examination of the Memoranda issued by the Board of Education shows that in most counties provision is now made for the instruction of farmers' sons, *i.e.*, boys who have already acquired farming skill and look to the school for instruction in agricultural science. This is clearly not the sort of education needed by a lad fresh from the city, unskilled in country arts and with little prospect of employment afterwards beyond the rank of a labourer. So far as the writer is aware only two institutions definitely aim at taking charge of city boys : the Scouts' Farm which Sir Robert Baden Powell has established at Wadhurst in Kent, and The Endowed School at Staunton-on-Wye, Hereford. The latter receives both boys and girls as boarders at low fees, and, in addition to school lessons, offers them work on a small holding, with dairy, poultry and gardens. The former merits special attention, because the boys are educated on novel lines ; they work in gangs or patrols on a farm of 200 acres ; and their discipline is not regulated by schoolmasters, but by the spirit of public service expressed in the Scout movement. Hitherto, most of the city-bred boys turned into farmers at Wadhurst have gone to the Colonies, and it was evidently the idea of the founder that English farm life would not supply a career for city boys lacking capital.

(*c*) The third group is the only one which conducts its operations on a large scale and is concerned with the lowest grade in English society, that is institutions for waifs and strays* maintained wholly by philanthropy, and the reformatory and industrial schools, maintained partly by subscriptions, but chiefly by the grants of Local Authorities and of the Home Office.

These institutions bring a certain proportion of their inmates

* I am under great obligation to Mr. C. E. B. Russell, His Majesty's Chief Inspector of these Schools, not only for advice but for enabling me to visit a few of them.

" back to the land " in two ways ; (1) Boys who are educated wholly in the cities are sent to farmers under licence, very often to South Wales or to Ireland, and are thus kept at farm work until at least 18 years of age ; (2) Some of these institutions are farm schools, *i.e.*, a farm is a part of the equipment and is maintained side by side with other industries, such as tailoring, shoe-making, carpentry or engineering. Thus the Lancashire Branch of the National Children's Home and Orphanage at Edgeworth is practically a model country village in which boys and girls engage in all the domestic, industrial and agricultural crafts which their common life demands. The Desford Farm School, a certified industrial school belonging to the Leicester Education Committee, specialises in farming and gardening, as well as in the staple trades of Leicester. The Little Commonwealth, conducted now for some four years near Evershot in Dorsetshire, is the most revolutionary venture in this field of social effort, and in its departure from conventional principles may be classed with the Scouts' Farm, which deals with boys from " good " homes, while the former receives children who have started on a criminal career and are in sore need of rescue.

The Little Commonwealth was so frequently reported upon in the press a year or two ago that it is unnecessary to describe its methods here. For the present purpose it should be observed that the farm is an important part of the equipment, and that some of the boys choose the farm or garden rather than more remunerative work in cottage building, on which they can be employed if they prefer.

There are at the very least 150,000 boys in industrial schools, reformatories, orphanages and other philanthropic institutions, who come from the congested areas of our cities. Many thousands of these are still housed in the cities, but their patrons are gradually realising more clearly the great benefits of open-air activity. It is not enough, however, to educate these young folk on the land ; a considerable proportion of them ought to stay there : not all, because one must admit that some are by temperament unsuited for country pursuits. The deplorable fact is that after a few years only a very small number remain on English land. Just as in the case of the Scouts' Farm, they are sent to Canada or Australia ; the superintendents again and again tell me that there is no room for them on English soil, *i.e.*, they can hope to secure at the best so scanty a livelihood that it is hopeless to encourage their natural bent towards a country life.

4. So much for a diagnosis of the situation. The remedies for this unsatisfactory state of things must clearly be sought in the field of social organisation, *i.e.*, the study of human nature as exhibited in country life, and regard for influences to which human nature (see par. 2 above) will respond. Research in agriculture, which has hitherto been mainly concerned with scientific problems of breeding and fertility, is not in itself sufficient to provide a solution, and a point has now been reached when sociological science must be called in to its assistance. To take an example: at present agricultural progress is hindered by the lack of workmen able to adapt themselves to the new conditions of farming, and it would provide a fascinating sociological study to determine the conditions under which the necessary type could be produced in sufficient numbers.

As regards measures for general improvement it should be possible to indicate directions in which the State, either the local or central authority, can help, but on the whole the problem is at present one mainly for private initiative.

5. It will be convenient to distinguish in our survey of proposals the different ages of the young people under consideration: (1) the children under 14; (2) youths from 14 to 18; and (3) the most difficult field of all, young men over 18 years of age.

(1) *Children under 14 Years of Age.*—It has already been pointed out that many thousands of children are cared for either at the public cost or by philanthropic institutions. Every one of these should be in the fresh air, and they would be the better, morally and physically, if they worked and played on the land. Here is surely a field where State action could operate with general approval. Huge industrial boarding schools and refuges which might well be transferred to rural districts are still maintained in the congested areas of large cities [The Edgeworth Cottage Homes referred to above present a model of what might be done.] These institutions enjoy large grants-in-aid and the State might properly make its support dependent upon this salutary change being effected. Even the day industrial schools could be removed to the outskirts of their cities, for the tramcars would carry the children out and in at the very times of day when the cars are making almost empty journeys.

Nor should the programme of the public elementary school escape notice. The most progressive schools are already doing a little gardening, and more could be done if advantage

were taken of the vacant plots of land which are seen in every city. These will not be built upon for a long time now, until national prosperity returns: why not let the elder scholars grow vegetables, keep poultry, and make such untidy places fair and sweet? It should be emphasised that all such suggestions are *directly in the interest of agriculture.* Every English boy or girl who grows up with a practical knowledge of what it means to keep live stock, and to grow cabbages and potatoes, is a potential friend of the farmer. At present many country folk regard city folk as enemies, or merely as purchasers of milk and meat, while city folk regard the country farm merely as a place to look at over a hedge. It would be to the national benefit to pay an extra grant to every city school which would produce a thousand eggs or a cwt. of sound potatoes per annum, just for experience of values gained by the children.*

(2) *Youths from 14 to 18 Years of Age.*—For fear of misunderstanding let it be said that consideration of the case of girls is omitted, not because they are unimportant but because, while girls need practical activities and fresh air as much as boys, additional considerations would be introduced if one tried to treat both sexes in one survey. It has already been pointed out that the first claim on the land comes from those who display physical or moral disability and who, if left in the city, will make a failure of life. The period of youth or early adolescence is, in many instances, a time of tragedy from this point of view. Every case "committed" by a Juvenile Court, where it is clear that the home cannot exercise control, ought instantly to be transplanted to the country with as much promptitude as a case of consumption or scarlet fever is dealt with. This suggestion is made quite regardless as to whether many of the cases will return to the city after 18. It would pay the State many times over to offer a premium for every such boy who is enabled to live successfully an open-air camp life from 14 to 18. The rule should be the same for boys in all ranks of society. The Scouts' Farm at Wadhurst and, possibly, the Endowed School at Staunton-on-Wye are worthy of more careful investigation than it has been possible to give to them. The Scouts' Farm is especially significant in its sociological aspect. The boys are organised as a community, working in gangs of six or eight, called patrols; one patrol works in the dairy for a month, then for a month in the fields, or in the workshop, or in the house doing domestic

* *Cf.* "School Gardens and Cookery Classes": *Times Educational Supplement*, 5th October, 1915.

service. This arrangement provides a social experience which life in the country usually fails to afford, and it is probable that some such form of communal activity is essential to sound development in the period of adolescence. It is, moreover, especially helpful to the prospective farmer, for it accustoms the lad to co-operation. One reason why lads of 18 flock to the towns is that the country is too "lonely," and they know that they can get companionship in the towns; but if a boy is introduced to farm life with an appropriate social organisation he will more readily find his own way out when he gets older: he will become a leader in co-operation among his neighbours; he will decline to remain in the old rut of isolation.

Neither man nor boy can learn co-operation except by practising it, and when every lad on a farm is helping his fellows he is not only learning farming, but is acquiring the social arts which are the basis of modern success in business. The same feature is witnessed, with a different type of human material, in the Little Commonwealth. In this case the youths have been transplanted straight from a society where they were both repressed and stimulated to lawlessness, to a community where all their social instincts find expression in normal rational activity. Both at Wadhurst and Evershot a regime of hard work is humanised by fellowship; and most adolescents require such fellowship. The life of such lads may be contrasted with the fate of many reformatory cases which used to be sent in large numbers to farms in Wales, where the very speech of the farmer's family was an unknown tongue!

It is suggested that the time has now arrived for extended sociological experiments by private initiative and philanthropy. No doubt care would be required in the selection of men to conduct such work—men like Baden Powell and Homer Lane are not to be picked up casually—but there are plenty of men helping in the Scout movement and other social work, who love country pursuits and have a grasp of the social principles involved in the guidance of youth.

Probably we are not ripe for State support in this field, although there seems to be no reason why a farm such as that directed by Sir Robert Baden Powell should not be treated as an efficient secondary school, entitled to earn grants from a local authority or from the Board of Education, as much as an institution which instructs in Latin and mathematics. It is doubtful whether experiment on the sociological side would have free enough scope if a public authority undertook to

supervise the programme, but one can fairly hope that the experiments at Wadhurst and Evershot will stimulate others to make similar experiments, in order to establish beyond doubt the intimate relation between agriculture and sociology.

(3) *Youths over 18 Years of Age.*—In all the institutions the writer has visited, he has inquired as to the extent to which boys over 18 years of age remain on the farm or seek other occupations. Considering the depressing outlook as regards wages and prospects of promotion, the replies received have not been discouraging, but it is not pretended that they have covered a large field of inquiry. In the industrial and reformatory schools, when a farm is carried on side by side with other employments, the boys see readily how much better off in pocket they will be if they select the factory and the workshop in preference to the garden or the farm. This is especially noticeable at Desford, where the governor gives every encouragement to the lads to choose the latter occupations, but he can scarcely contend against the highly-paid offers of the Leicester boot factories. The influence of the home (which did nothing, or worse than nothing, for the lad when he was little) is often exerted to get him back to the city. Many of these boys *want* to remain on the land; they especially like being among horses and cattle (they often, indeed, prove useful as grooms and coachmen), but circumstances prove too strong, and a lad who might be a capital asset to the agricultural interest goes back to the city; all the better, it is true, for his sojourn on the farm, but losing the best chances for development in the national interest. The competition within these industrial schools and reformatories does not seem to me therefore to be quite fair. If city boys are to be turned into farmers they should belong to a community where everyone is on the job, as at Wadhurst, and, in a less degree, at Edgeworth. This would give them more pride in their calling and more readiness to pick up the scientific side of it; youth is very susceptible to leadership and the hope of achieving a fine result. Both at Desford and at Wadhurst the farm buildings are good, and there is an air of efficiency, which is needed if active and intelligent boys are to conceive a life-long attachment to their employment. If, however, during these years of training, they mix with boys who are pursuing a rival trade with better prospects, their enthusiasm may be damped. Hence, it is desirable that some schools of this type should be confined to farming and cottage building, following the example of Wadhurst. Every inmate would then feel something of

the enthusiasm needed to revive rural England, determined, in spite of obstacles, to forge ahead in village life and make a place and home for himself. Your true countryman will not live in the city on any account, and this *esprit de corps* can be created in a farm school as readily as in a public school, as soon as men who understand boy nature are forthcoming.

6. The resources of social organisation, however, are not exhausted when the city boy, alert and eager, has got his feet well planted on the foot of the agricultural ladder. We live in a time when "after-care," employment exchanges and other forms of machinery are devised in order to help young folk to find a hopeful career. Machinery of the employment-exchange type is well adapted to meet the needs of some industries, and, in times of crisis, to supply temporary assistance to farmers; but before it can be of much use in supplying permanent labour the prospects must be very much improved and must be sufficiently promising to induce an increasing number of young people to settle down in the country and marry.

They are, perhaps, capable of getting more out of the land, and therefore of putting more money into their pockets, than ordinary agricultural labourers, who have often neither the ambition nor the organising social power which the former possess.* On the other hand, they have not the capital to make a start, and without spending a few years in gaining experience they would be incompetent to make a start even if the money were forthcoming. To bid them go into the open market without any hope of advancement is futile: so long as agricultural employment is so ill-organised as to turn adrift two men out of three who take it up in boyhood, no one can expect these lads to enter it with hope of success.

Can any resources be found to enable the agricultural interest to utilise this human material and keep it on the land? Those immediately concerned in this aspect of the problem are (*a*) the large farmers and scientific landowners who want labour of first-class quality and can pay well for it; (*b*) the governors and patrons of the institutions where these lads are trained; and (*c*) the enthusiastic supporters of the Agricultural Organisation Society, whose special mission it is to promote co-operation and initiative in small holders and the like. All these classes of persons are concerned in devising such organisation as shall encourage and advance the position

* The country-bred boy, however, has knack and endurance. In such qualities no one can pretend to equal the youngster on the farm, who helps father and mother as soon as he can toddle about.

of every lad of promise : other lads may cheerfully be allowed to return to the cities ! If the influential men who are promoting agricultural co-operation in various ways agree that this problem is important, and would confer with those who support the institutions here brought under review, some solution would be found. The matter is a difficult one, but it is clear that the hindrances which prevent young men from remaining on the land are not chiefly a question of wages, in which matter the country can never beat the city. What the young man wants is (1) society, *i.e.*, the comradeship of men (and after 18 or 20 of women also) engaged in the same line of life as himself, and sharing his hopes of making a good thing out of country life ; and (2) prospects, *i.e.*, a fair expectation of being able after a few years to settle down and marry.

Since under present conditions neither congenial society nor reasonable prospects are available, new organisation is necessary to pioneer a new method. The writer can conceive the establishment (say in connection with the National Children's Home or with the Scouts' movement) of a centre in some agricultural area where co-operation is being preached : a place where a few young men can live during the critical years from 18 to 25, working on the land at reasonable wages, but coming in contact with the agricultural revival. An experiment which combines experience in social reform with experience in agricultural reform would be worth trying, for it would respond both to the intellectual and to the social needs of young men who have been bred in institutions and have thus learned the value of social action.

If it be not regarded as too fantastic the writer would carry the reader's mind back to those far-off days of the Middle Ages when monastic communities, Cistercians, Benedictines and the like, were the agricultural colleges of Great Britain, combining a social life adapted to the times with an enthusiasm for country pursuits and for agricultural skill. If enthusiasm for progress is to be revived, it must be admitted that the isolation so characteristic of farm life is a drawback which needs to be met by practical experiment in social organisation. History, here or elsewhere, should repeat itself, not in detail, but in the wide scope of human need. When Fountains Abbey, Tintern Abbey and the rest declined from their noble purposes and were left to ruin, they deprived the land of resources for agriculture and for society which have never been replaced.

These pioneers and investigators broke up the soil of our country in the higher interests of mankind, and their example invites us with our more enlightened knowledge and with our wider sympathies to renew the struggle on behalf of a New England, forced by a titanic war to re-shape its ways. Once again we may witness men of the city and men of the farm, men of learning and men of labour, uniting on behalf of English youth, using the native soil as an instrument of our high destiny, as a weapon not merely of commercial prosperity, but of moral and social betterment. If this land of England falls on evil days and suffers, it will not be for lack of bread but for lack of vision, for "without vision the people perisheth."

NOTE.—There is another field for inquiry affecting the fortunes of city children, which I have omitted because it needs separate treatment, viz.: the possibility of giving boys (and girls, too?), the chance of learning gardening before they leave school. Thus a supply of town artisans would be secured, ready to work allotments in their spare time and so increase greatly the food resources of England. This is a most important problem, and great good could be effected if City Education Authorities realised what is possible during the last two years of school life. But this topic needs detailed discussion beyond the limits of this article.

REPORT ON FURTHER INVESTIGATIONS ON THE CAPSIDS WHICH ATTACK APPLES.

J. C. F. FRYER, M.A. (*Entomologist to the Board*),

AND

F. R. PETHERBRIDGE, M.A. (*School of Agriculture, Cambridge*).

A PRELIMINARY account of the injuries caused to apples by plant bugs of the family *Capsidæ* appeared in the issue of this *Journal* for January, 1916. During the following summer conditions generally were not favourable to research, but a number of additional observations were made, and it may, therefore, be of interest to record the progress of the investigation up to the present date.

The work for the year was first planned to include both a detailed study of the life histories and habits of the bugs, and also preliminary trials of those insecticides which seemed most likely to prove effective, but it was found impossible to carry out the whole of this programme. The first section, therefore, was confined to field observation and to certain minor experiments on the various species suspected of causing damage.

The trials of insecticides were devoted primarily to testing the value of nicotine which had previously given the best results in this country, and which is evidently regarded in America as practically the only specific of real use against Capsids.* Unfortunately, bad weather during the vital period preceding the bursting of the blossom greatly hampered all spraying, and, subsequently, shortage of labour made it necessary to omit some of the experiments which were to have been carried out after the fruit had set. Difficulties of this nature, however, must not be regarded as altogether a disadvantage; they are inseparable from commercial fruit culture, and it would be of little use if treatments were devised which could only give success in favourable years.

The opportunities for carrying out the experiments were provided by Mr. Collins Clayton and Mr. F. Glenny, of Wisbech, while Mr. Travell, of Alcester, has furnished notes on spraying, carried out by him at Dunnington. The authors wish to

* The American Capsids are not the same as those which attack apples in England, and, although they are both killed by a nicotine spray, it must not be thought that statements as to Capsids in American publications will necessarily apply to Capsids occurring in England.

express their gratitude to these gentlemen for the great assistance they have given.

General Notes.—Since only a short time elapses between the first appearance of the bugs and the opening of the blossom, it is important from the spraying point of view to know as accurately as possible when the majority of the bugs are hatched. In previous years the earliest date on which they were out in considerable numbers was 14th April (in 1913). A visit to the Wisbech district was therefore made on 10th April, but no bugs were seen. A further inspection was made on 17th April, but again no hatchings had taken place. On the 25th a few newly-hatched bugs and the first signs of damage were noted, and by 1st May the insects were plentiful. Newly-hatched bugs, however, could be discovered for at least a fortnight after this date, and it is probable that the cold, wet weather which occurred at that time greatly hindered their emergence. These notes refer to the Wisbech district; at Alcester, Mr. Travell reported the first appearance of the bugs on 27th April, and it is probable that they continued to emerge for at least the following fortnight. It seems evident then that the period during which the bugs are hatched and the blossoming period of the apples may to some extent coincide, which will tend to increase the difficulties of dealing with the bugs by spraying.

With reference to the species of bugs concerned, the records in the case of the Wisbech district refer essentially to the green bug—*Plesiocoris rugicollis*—which has previously been shown to be the chief culprit. The dark-coloured, brown, black, or sometimes red bug *Psallus ambiguus*, which is not regarded as injurious to the fruit, hatches at about the same time. Owing to the great difficulty in distinguishing the young of *Orthotylus marginalis*—the other green bug under suspicion—from those of *Plesiocoris rugicollis*, no observations on its first appearance can be offered; in fact it was only by means of subsequent breeding experiments that the insects first noted at Wisbech were definitely identified.

These breeding experiments were as follows: young bugs were caught in the Wisbech district during the beginning of May and sleeved (*i.e.*, caged in loose, muslin sleeves) on dwarf apple-trees growing in pots—the varieties being Grenadier, Allington Pippin, Lord Derby and Lane's Prince Albert, all known to suffer from the attack. Each bug was sleeved by itself on a truss or young shoot and observations were then made on the damage done. As a result, all the green bugs which were so treated produced typical capsid injuries to the



Photograph of Allington Pippins illustrating degrees of intensity of attack of Capsid Bugs on apples.

Fig. 1, Grade 1; Fig. 2, Grade 2; Fig. 3, Grade 3; Fig. 4, Grade 4.

shoots, and, so far as the experiments went, to the fruit—though the latter, owing to insufficient feeding or underthinning, fell off when about half-grown. The young apples which had been sleeved with green bugs showed developing cracks and scars exactly like those noted in the open on attacked apples of the same stage, while apples not so treated were undamaged. The green bugs which were responsible for this injury in every case (24) were identified when adult as *Plesiocoris rugicollis*. The exact damage produced by the other green bug *Orthotylus marginalis* could not, therefore, be studied. It was also noted by means of similar experiments that the brown bugs *Psallus ambiguus* and *Atractotomus mali*, of which the latter has been regarded with considerable suspicion, produced no damage to the fruit, and that in these experiments even their feeding punctures on the leaves were not of any importance.

The evidence obtained during 1916, therefore, supports the conclusions previously drawn—to the effect that the most serious pest is the green bug *Plesiocoris rugicollis*—while the brown or red species of the genera *Psallus* and *Atractotomus* are harmless, or at most only of secondary importance.

With reference to the variation in susceptibility to injury shown by different varieties of apple it must be recorded that in 1916 Early Victoria (Emneth Early) and Bramley's Seedling proved less resistant than in former years, and it is no longer possible to name any variety which may not at times be seriously damaged. The resistance previously noted does not imply that the bugs themselves prefer one variety to another, but rather that in certain varieties the powers of recovery are much greater, the punctures healing rapidly without the production of scars. Such powers of recovery are probably dependent not only on the constitution of the variety but also on the season, and it is quite possible that in more favoured years these two varieties may again show a comparative immunity.

As regards other plants attacked by Capsids, it was mentioned in the previous account that red currants were occasionally injured by the green bug *Plesiocoris rugicollis*, but it was not known then whether eggs were laid, and whether the entire life history was passed on this plant. During 1916, there appears to have been a marked extension of this attack on currants, notably, however, on black currants. A number of cases were reported in which almost every leaf showed the typical brownish spots, and the foliage from a distance appeared

discoloured as if by a bad attack of Red Spider. In several of these cases there were no top trees, and young, wingless bugs were numerous, from which it may be deduced that the insects had emerged from eggs laid on the currants. In the previous cases which had been examined, the currants were growing under attacked apple trees, and there was, therefore, the possibility that the currants had only been adopted as a secondary food plant by individual bugs which had fallen from the apple trees. This theory is evidently incorrect, and Capsid bugs must be regarded as a definite pest of both black and red currants.

Finally, reference may be made to one of the strange features of these Capsid attacks, of which the currant cases form a typical instance. In the district in which the injury to currants was most prominent, no single case of damage to apples has been recorded, although apples are widely grown. Similarly the bugs have been noted attacking willow trees, the branches of which were actually touching those of an apple and yet the latter was entirely neglected. Such observations all point to the fact that these Capsids are only now discovering that cultivated plants will suit their needs as well as, or better than their original wild food plants, and since they can live on such different forms as willow, apple and currant, there seems nothing to prevent a still further increase in their destructive activities, a prospect which must be regarded with some alarm.

Spraying Experiments.—1. *At Mr. Clayton's orchards at Walton Highway.*—The following experiments were carried out at Walton Highway, near Wisbech. The variety of apple was "Lord Derby." The trees were about 20 years old, and the orchard was under grass, the latter being sown down in 1912. These trees all suffered badly from Capsid attack in 1915. Each row contained 9 trees, and one or more trees in each row remained unsprayed.

Plot 1.—First 6 trees sprayed on 4th May, 1916.	
Bordeaux arsenate	5 lb.
Nicotine	3½ oz.
Water	40 gal.
Plot 2.—First 7 trees sprayed on 4th May, 1916.	
Lime sulphur	1 gal.
Nicotine	3½ oz.
Water	40 gal.
Tree No. 6 was also sprayed on 1st June with	
Lime sulphur	1 gal.
Nicotine	3 oz.
Water	40 gal.

Plot 3.—First 8 trees sprayed on 4th May, 1916.

Lime sulphur	1 gal.
Nicotine	3½ oz.
Lead arsenate	2 lb.
Water	40 gal.

Plot 4.—First 8 trees sprayed on 5th May, 1916.

Soft soap	2¼ lb.
Paraffin soft soap	2¼ ,,
Nicotine	3 oz.
Water	40 gal.

Plot 5.—First 8 trees sprayed on 5th May, 1916.
Mixture as Plot 1.

Plot 6.—Three trees at each end sprayed on 6th May, 1916

Soft soap	4½ lb.
Nicotine	3½ oz.
Water	40 gal.

Plot 7.—Three trees at each end sprayed 6th May, 1916.

Paraffin soft soap	4½ lb.
Nicotine	3 oz.
Water	40 gal.

Plot 8.—First trees not sprayed. Next 6 sprayed on 6th May.

Soft soap	4 lb.
Nicotine	3 oz.
Lead arsenate	1 lb.
Water	40 gal.

Trees 1 and 2 were also sprayed on 1st June with

Soft soap	4½ lb.
Nicotine	3 oz.
Water	40 gal.

Plot 9.—An attempt was made on 1st June to knock off the Capsids with sharp spray of water, but this proved unsuccessful.

Plot 10.—Several rows unsprayed.

N.B. :—The paraffin soft soap and the Bordeaux arsenate were purchased as such.

Five to 7 gal. of wash were used per tree. Mixture 1, used on Plots 1 and 5, caused some slight scorching of the leaves but very little harm.

All the above-mentioned spray fluids killed the Capsids which were covered with the wash, and it was noticed that in those washes which contained soft soap and nicotine the Capsids were killed very quickly. With lime sulphur and nicotine the Capsids were not killed so quickly.

After the spraying, many Capsids were found alive on the trees. These were probably not touched by the spray fluid, as many of them were present in the curled leaves of the young shoots where they usually feed. From this it will be gathered that, in order to kill a large percentage of the Capsids, spraying will have to be very thorough and large quantities of wash will be required.

The sprays applied on 1st June killed a large proportion of the Capsids, but at this date much of the damage to the fruit had already been done.

All the sprayed trees were separable from the unsprayed ones, as they made a much larger growth of leaves and shoots. This was to some extent due to the reduction of caterpillars by spraying. An examination of the trees in September showed the following results: Plots 1 and 5 carried the heaviest crop and suffered the least from Capsid attacks. Plots 4, 6, 7 and 8 were slightly more marked by Capsids than 1 and 5. Plots 2 and 3 were more marked than Plots 4, 6, 7 and 8.

All the sprayed trees were much cleaner than the unsprayed ones, in spite of the fact that the crop was a very small one. On many of the unsprayed trees all the apples were badly marked by Capsids.

It should be noticed that the sprayed trees have made much better growth than the unsprayed ones, and should reap the benefit of this in future years.

2. *Newton* (*Mr. F. Glenny*).—The block chosen for the experiment consisted of 10 rows, each containing from 30 to 35 trees of the varieties Grenadier and Allington Pippin alternately. The trees had been planted for about 6 years, but the presence of the bugs was not noted until 1914; the trees were inspected in 1915 when considerable damage had been done to the foliage and young shoots, and bugs were numerous, at least 80 per cent. being the species *Plesiocoris rugicollis*. In the early spring of 1916 it was evident that there would be a good show of blossom and, if conditions proved favourable, a sufficient crop to show with accuracy the effect of the different spray fluids, since in both Grenadier and Allington Pippin the fruit is extensively damaged. As has already been mentioned, bugs first appeared about the 25th April, but since the hatching seemed to be proceeding slowly spraying was postponed as late as possible—until the 8th May, when the blossoms were about to open. At this date bugs were hardly as numerous as had been expected from the damage done the previous year. The larvæ of the winter moth were beginning to appear, however, and the bugs often sheltered between the leaves which had been spun together and were, therefore, more difficult to observe. In the same manner they were also able to find considerable protection from the spray.

Spraying began on 8th May in dull, showery weather which, though not sufficiently bad to stop the work, must have reduced the efficiency of the sprays considerably. On the following day

heavy rain made all work impossible and the spraying was not concluded until the 10th, when the weather had greatly improved.

The experiment was arranged as follows :—

Row.	*Date of Spraying.*	*Formula.*	*Comments.*
1 ..	Half row on 10th May.	Lime ½ cwt., water 40 gal.	This row does not form part of the main experiments, but is included for reasons which will appear subsequently.
2 ..	8th May ..	Nicotine (98–9 per cent) 3 oz., soft soap 4 lb., water 40 gal.	—
3 ..	Unsprayed ..	—	Control.
4 ..	8th May ..	Nicotine 2 oz., soft soap 4 lb., water 40 gal.	Light rain.
5 ..	Unsprayed ..	—	Control.
6 ..	8th May ..	Soft soap 6 lb., water 40 gal.	To test value of soap without nicotine.
7 ..	10th May ..	Nicotine 2½ oz., lime sulphur (sp. g. 1·3,) 1 gal., water 40 gal.	A start was made with this mixture on 8th May, but heavy rain made the work useless, and it was all sprayed on 10th May.
8 ..	Unsprayed ..	—	Control.
9 ..	10th May ..	Resin 6½ lb., soda 5 lb., water 40 gal.	Only half row sprayed, as the resin was entirely precipitated by the hard water.
10 ..	10th May ..	Formula as in Row 2.	The bad weather on 8th May made it advisable to test the formula under better conditions.

The sprays were applied by means of a small petrol engine giving a pressure of 60 lb. to 80 lb., and medium coarse nozzles were used on the lances. The amount of spray fluid used per tree worked out at a little over 3½ gal., but there was considerable wastage owing to the necessity of pumping out the pipes between each separate experiment, and if one spray fluid had been used throughout 3 gal. per tree would have been ample. Water was obtained from a well in a neighbouring dyke and was found to be excessively hard, so that 4 lb. of soap in 40 gal. of water were probably not sufficient and the resin wash was practically useless.

Four trees in Rows 2 and 4 were banded as for winter moths, for, although it did not seem likely that very young bugs would be knocked off by the spray, it was felt that the point should be tested.

Results.—The bands just mentioned were examined on the 10th, two days after the trees had been sprayed, but only one or two bugs were found on them, and it is evident that if any bugs were knocked off they never regained the trees. It did not seem, however, that the very young bugs were easily forced off the twigs, and the habit of jumping or falling when disturbed is probably not acquired until later.

Observations made during the application of the sprays showed that, as at Mr. Clayton's orchards, all bugs actually wetted by a nicotine spray were killed. The difficulty consisted in spraying with sufficient thoroughness to reach those insects which were sheltered in the trusses, under leaves, etc., or, in the present case, between leaves which had been spun together by winter moth larvæ. Further inspections were made on various dates during the summer and only slight differences could be detected in favour of those rows which had been sprayed with nicotine. On 3rd August, when the fruit was sufficiently large, a careful comparison was made with reference to the scarring produced by the bugs, and again the evidence was only slightly in favour of the nicotine-sprayed rows—notably Row 10, which adjoined a road, and so perhaps was more easily seen. It was then decided that the crop on the Grenadiers was too small to justify a final comparison when the fruit was picked, but that on the Allington's was better and was sufficient to give results, although, in view of the very slight differences which had so far been detected between sprayed and unsprayed trees, only negative results were anticipated. This final examination, made when the apples from the Allington's were picked, was carried out as follows: The apples from 12 trees in a row were picked into baskets holding approximately 2 stones of fruit. The contents of the baskets were first roughly compared and then two average baskets were selected for a more detailed examination, which consisted in grading the fruit in accordance with the damage caused by the bugs. Four grades (*see* Plate) were selected, of which Grade 1 contained those apples which were unmarked or hardly marked by the bugs. Grade 2 consisted of fruit which was scarred but not to such an extent as to cause any marked depreciation in its market value. Typical examples showed from two to five quite superficial scars. Grade 3 contained apples which were badly scarred and usually somewhat distorted in shape. Grade 4 contained fruit which was deeply scarred, much distorted and usually cracked.

In this classification, Grades 1 and 2 would contain marketable fruit, while 3 and 4 would rank as " bag stuff " only. It may also be noted that this grading, which was made solely on the intensity of the injuries caused by the bugs, corresponded almost exactly with a grading by size of fruit alone, *i.e.*, unmarked apples were large, badly marked apples small ; and it would appear that the attacks of the bugs not only spoil the quality of the fruit but produce a corresponding reduction in its size.

The results of this grading are given in the following table :—

(1) Experiment.	(2) Grade 1.	(3) Grade 2.	(4) Grade 3.	(5) Grade 4.	(6) Grade 1 + 2. Marketable Fruit from 12 Trees.	(7) Grade 3 + 4. Bag Fruit from 12 Trees.	(8) Total Crop from 12 Trees.
	p.c.	p.c.	p.c.	p.c.	Stones.	Stones.	Stones.
1. Limewash ..	28	26	36	10	14¾	12¾	27½
2. Nicotine 3 oz., soft soap 4 lb., water 40 gal.	45	31	18	6	31¼	10¼	41½
3. Control (unsprayed).	6	16	54	24	2	7	9
4. Nicotine 2 oz., soft soap 4 lb., water 40 gal.	14	20	56	10	6½	13	19½
5. Control (unsprayed)	13	21	52	14	4	7½	11
6. Soft soap 6 lb., water 40 gal. ..	24	19	49	8	4¾	6¼	11
7. Lime sulphur (sp. g. 1·3) 1 gal., nicotine 2½ oz., water 40 gal. ..	31	23	40	6	26	22	48
8. Control (unsprayed)	7	15	54	24	3¾	12¾	16½
9. Resin 6½ lb., water 40 gal. ..	14	14	56	16	3½	8½	12
10. Nicotine 3 oz., soft soap 4 lb., water 40 gal.	36	28	33	3	27¾	15¾	43½

In the first column the number of the row and the nature of the experiment are indicated. The second column contains the percentage of first grade apples calculated from the results obtained by grading the two average baskets. The third, fourth and fifth columns similarly show the percentage of apples which were classified as Grades 2, 3 and 4. Column six gives the weight in stones of marketable fruit, seven the weight of " bag " fruit, and eight the total crop obtained from the 12 trees which were examined.

The table as a whole needs little comment, and, from the commercial point of view, columns 6, 7 and 8 speak for themselves. It may also be of interest to draw attention to certain further results which are obtained by summarising columns 2, 3, 4 and 5.

In the first place the three unsprayed rows taken together gave an average of 26 per cent. good fruit and 74 per cent. bad, and an average crop of about 1 stone per tree. With this may be compared the two rows 2 and 10 which were sprayed according to the formula—nicotine 3 oz., soap 4 lb., water 40 gal. These rows gave an average of 70 per cent. good fruit and 30 per cent. bad, with an average crop of $3\frac{1}{2}$ stones per tree.

Row 7, nicotine and lime sulphur, gave a still larger yield, *i.e.*, 4 stones per tree, but the grading, 54 per cent. good and 46 per cent. bad, is not quite so striking, though the comparison with the control rows is still markedly favourable.

Row 4, in which the strength of the nicotine was considerably reduced, gave very poor results. This may be due to the rain which fell while the row was being treated or to the fact that the nicotine had been so far diluted that its insecticidal properties were lost, though the latter explanation is less likely in view of Mr. Travell's experiences.

Of the other treatments, Row 6, sprayed with soft soap alone, gave a crop of under 1 stone per tree, grading 43 per cent. good and 57 per cent. bad, which clearly shows that the nicotine is necessary and that soap alone is not sufficient. This is of some interest, since wherever bugs were found which had been wetted by the soap spray they were dead, and at first it appeared that soap alone might be effective.

Resin wash—used on Row 9—was also of no value, but in view of the hardness of the water the test cannot be considered satisfactory. The experiment was made as it was believed that any wash which left the foliage for a time in a sticky condition might be fatal to the young bugs, but since the resin was entirely precipitated as a thick curd before it reached the trees the point was not decided. Row 1, in which a lime wash was applied at a very late date, is included, since there is a distinct gain both in grading and crop as compared with the control rows. It is probable that the lime in this case smothered many of the newly-hatched bugs, and in further experiments it may be well to test it more thoroughly. It may be of interest to note that in spite of the condition of the trees, the blossom being almost open, the injury done could hardly be detected and had no permanent effect on the foliage or crop.

As a whole, in spite of the smallness of the crop and the generally unfavourable conditions under which the work was carried out, these experiments are a striking testimony in favour of nicotine.

3. *Spraying at Dunnington, Alcester.*—Mr. H. W. Travell has kindly given the authors permission to include observations made by him when experimenting with various washes against Capsids. Specimens received in 1915 appeared to show that in his orchards *Plesiocoris rugicollis* is the predominating species, though *Orthotylus marginalis* is also present. Mr. Travell writes that owing to the weather he was unable to begin spraying as early as he wished, and that when a start was made considerable damage had already been done.

His experiments were as follows :—

1. " About 60 trees of Early Victoria, the trusses just about expanding, were washed with nicotine and soft soap " made according to the following formula :—

Nicotine, 98 per cent.	.. 5 oz.	*i.e.*	2 oz.
Soft soap	.. 8 lb.		3 lb.
Water	100 gal.		40 gal.

Several control trees were left unwashed, and " it was found upon examination that the majority of the bugs were destroyed, it being rather difficult to find any live ones after the washing. On examining the unwashed trees several weeks afterwards they were found to be only a very little more affected than the ones which had been washed." Mr. Travell considers that the damage was done before he was able to begin spraying.

2. " About 40 Early Victorias were washed with paraffin soft-soap mixture directly after the others had been treated with nicotine and soft soap." Mr. Travell states that " This wash did not prove nearly so successful as the former, a large number of the bugs being seen alive afterwards. In both cases the trees were well drenched with the wash."

3. Two hundred and fifty Worcester Pearmains were washed with nicotine and soft soap on 16th May. " Shortly after spraying a large number of bugs were observed to be killed."

Mr. Travell finally draws the following conclusions :—

1. " Washing should commence as soon as the bugs are observed. The damage is done very quickly and over a large area, the bug being so active."

2. That after trying various washes (in addition to those mentioned above) " nicotine and soft soap proved by far the most effective."

3. That the pest is very much on the increase. "Bramleys, Early Victorias and Newtons, which were hardly touched last year, were badly attacked this season." Also "some black currants which are near the affected apple trees have their leaves punctured in the same manner."

General Conclusions.—Summarising the conclusions which may be drawn from the experiments as a whole it is clear that nicotine, even when highly diluted, is fatal to the bugs and is the best insecticide to use. It may be applied in conjunction with soap, lime sulphur or Bordeaux, but the choice must depend on local circumstances as, for instance, on the presence or absence of scab or on the nature of the water available, which, if very hard, may make the use of soap inadvisable. The expense of nicotine is often put forward as an argument against its use, but provided it attains the desired object this argument seems faulty. In the experiments at Newton, for instance, the nicotine and soap wash containing 3 oz. of nicotine to 40 gal. of water cost just over 1*d.* per gal., but in normal times would be just under 1*d.* Each tree if sprayed commercially would have required about 3 gal. of wash costing 3*d.*, as compared with about 1½*d.* if a cheap wash had been used. The yield per tree even in a bad season was increased from 1 stone to 3½ stones, while the quantity of sound apples was increased from 26 per cent. to 70 per cent. Such increase both in quality and crop would seem to justify not only the labour, which is the same whatever wash is used, but also the selection of an insecticide of proved efficiency even if it is expensive.

Finally, a point arises from the Newton experiments which requires special emphasis. Up to the time when the crop was picked neither Mr. Glenny nor the authors of this paper were able to detect more than a slight advantage in favour of the nicotine-sprayed rows, and the results of a careful grading and weighing of the crop were a complete surprise. It seems evident then that in Capsid attack the gain from spraying cannot be judged by even a thorough examination of the sprayed and control plots, and that before any experiment can be considered to have failed it is essential that the fruit should be weighed and graded in accordance with the damage done by the bugs.

THE OVERHEAD ELECTRIC DISCHARGE AND CROP PRODUCTION.*

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Description and Treatment of Selected Area.—The experiments upon the effect of the overhead electric discharge upon crop production were continued during 1916 at Lincluden Mains Farm, Dumfries. These experiments, as in previous years, owe much to the careful way in which they were carried out by Miss E. C. Dudgeon. As in 1915, oats were chosen for the experimental crop. A large field of nine acres which in the past had given uniform crops was selected; the soil was a sandy loam.† The field had been in pasture without manure for the three previous years, having been grazed by cattle and occasionally by sheep.

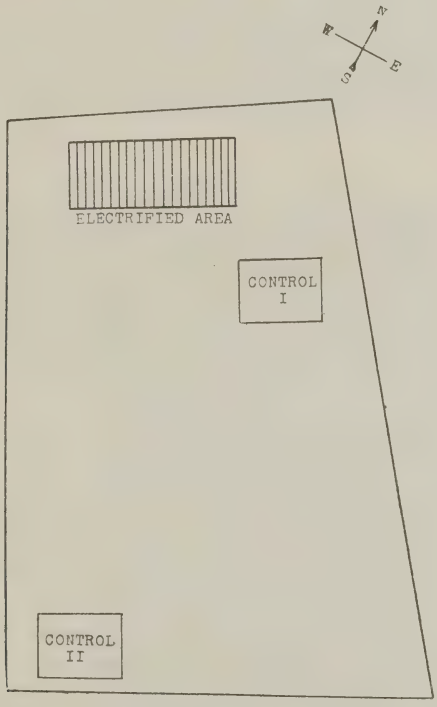


Fig. 1.

* Previous accounts of investigations will be found in this *Journal* for April, 1910, p. 16; January, 1912, p. 862; October, 1913, p. 582; January, 1915, p. 944; and October, 1916, p. 671.

† The Lincluden district has a thin coating of glacial débris on a deep sandy foundation.

Of this field one acre was selected as the electrified area, and two half-acres were chosen as controls. The relative position of the three plots in the field is shown in the accompanying diagram (Fig. 1). Control I. was not far from the electrified area, but, as measurement showed, it received only a slight discharge when the wind blew from the west and north-west. Control II. lay south-east of the electrified, area and so was out of the track of the prevailing westerly winds; also, it was at such a distance from the electrified area that even with north-west winds it received practically no discharge.

The difficulty of confining the discharge to the special area to be electrified is much reduced by keeping the wires low.* The "earthed" screen of wire netting, which was used in previous experiments to prevent the spread of the discharge to the control areas, was found in 1916 to be unnecessary owing to the low position of the discharge wires and the distance and position of the controls.

The overhead discharge was applied by means of a series of 21 wires running parallel to the short sides of the rectangular area (88 by 55 yd.), the wires being thus about $4\frac{1}{2}$ yd. apart. The wires were supported at their ends at a height of 7 ft. from the ground, but, towards the close of the experiment, sagged downwards at the centre to a height of only 6 ft. The current supplied through the primary circuit was about the same as in previous years, namely, 3 ampères, at 50 volts, but owing to the lower level of the wires (7 ft. as compared with 10 ft. in 1915, and 15 ft. in 1914) and the closed arrangement of the wires ($13\frac{1}{2}$ ft. as compared with 15 ft. in 1915, and 20 ft. in 1914) the intensity of the discharge received by the crop was much increased.†

Effect of Electrical Discharge on Crop.—The crop was sown on 27th March, and appeared above ground on 13th April, the discharge being started on 14th April. By 16th May there was a marked difference between the electrified and the control areas, the plants which had received the discharge being of a markedly deeper green colour and also taller. Measurements were taken at intervals of the average height of the plants on the three areas; the results are given in the following table:—

* It has been shown by Jörgensen and Priestley (*Journal of Agricultural Science*, VI., 1914) that when the wires are fixed at a considerable height above the ground the wind may carry the discharge over a wide area.

† The intensity of the discharge received can be increased by (1) lowering the wires, (2) reducing the distance between the wires, (3) reducing the thickness of the wires. The wire employed was "silicium bronze" of gauge 24.



FIG. 2.



FIG. 3.

Photographs of Electrified (Fig. 2) and Control (Fig. 3) Plots, taken on 8th August, 1916. The figure standing in the crop is at the same distance from the camera in each case.

	18th June.	*25th June.*	*3rd July.*
Electrified	.. 19 in.	.. 24 in.	.. 32 in.
Control I.	.. 14 ,,	.. 19 ,,	.. 21 ,,
,, II.	.. 12 ,,	.. 18 ,,	.. 20 ,,

After 3rd July it was not possible to get among the plants without damaging the crop ; the measurements were therefore discontinued.

It was clear that the effect of electrification extended some little distance from the electrified area, for the height of the crop around the area was above the average and gradually decreased with increasing distance from the experimental area.

The discharge was continued until 17th August, being used only in the daytime and discontinued during actual rain. The discharge was applied for 848 hours altogether during the season.

The season was very good up to the middle of August and, as the photographs (Figs. 2 and 3) taken on 8th August show, the electrified crop was markedly taller than the rest of the field and much heavier in grain ; it was generally agreed that it was the finest crop of oats in the district. Unfortunately, heavy rain storms set in during the latter part of August and caused considerable " laying " of the heavy electrified crop, and also delay in cutting. This led to failure to garner the whole crop, owing mainly to loss of grain before harvesting. The crop was cut on 28th and 29th August, carted on 11th September, and threshed on 12th September.

The yields obtained on harvesting are given below for the electrified area and the two control areas. The grain was weighed as a whole, and the result is given in bushels of 42 lb. ; in the case of the straw every tenth " bunch " was weighed. and the weight of the whole crop calculated from the average weight of the " bunches " so obtained.

	Grain.		*Straw.*	
Electrified Area (1 acre).	62·8 bush. (2,637 lb.)	Qual. 1, 1,942 lb. ,, 2, 695 ,,	4,924 lb. (316 bunches, av. wt. 15·6 lb.	
Control Area I. (½ acre).	20 bush. (840 lb.)	Qual. 1, 630 lb. ,, 2, 210 ,,	1,218 lb. (99 bunches, av. wt. 12·3 lb.	2,619 lb.
Control Area II. (½ acre).	22 bush. (924 lb.)	Qual. 1, 714 lb. ,, 2, 210 lb.	1,401 lb. (103 bunches, av. wt. 13·6 lb.	

The electrified area, as compared with the control areas, gave an increased yield of 20 bush. (840 lb.) of grain (14 bush. of first quality and 6 bush. of second quality) and 2,305 lb. straw. Calculating the percentage increase over the two control areas we obtain the following result :—

Increase in grain, 49 per cent.
,, straw, 88 ,,

After making allowance for the large experimental error inherent in agricultural experiments where the number of plots is small, it is clear that these results—taken in conjunction with those of 1915 (in which oats subjected to a weaker discharge yielded 30 per cent. increase in grain and 58 per cent. increase in straw)*—demonstrate that under the conditions of the experiments oats respond very markedly, by an increased yield both in grain and straw, to the action of the overhead electric discharge.†

It is not possible at present to estimate accurately the financial results of the experiment. At Lincluden electric current from a power station is not obtainable, so the supply was derived from a small dynamo driven by a petrol engine. The apparatus used to produce the necessary high tension current is comparatively inefficient and not such as would be used for work on a large scale. It may be stated, however, that taking the price of produce in the district at the end of September, 1916 (oats, 1st quality, 3*s.* 9*d.* per bush.; 2nd quality, 3*s.* 1*d.* per bush.; straw, £2 15*s.* per ton) the increased value of the crop works out at £6 7*s.* per acre. The cost of the current used, about 130 B. of T. units, when calculated at 1*d.* per unit, works out at only 11*s.* The cost of an installation on a large scale cannot be predicted at present, but the profit shown above would permit of a heavy expenditure on an installation.

Residual Effect of Discharge.—A new and important aspect of the problem has been disclosed by the discovery that the application of the discharge one year may increase the size of the crop the next year, *i.e.*, there may be a marked "after effect." The field in which the experimental crop was grown in 1915 was sown with clover and grass at the same time. The difference between the crop of clover-hay produced in 1916 on the electrified area of 1915, and that on the non-electrified area, was very obvious to the eye, and there was a marked increase in the weight of the crop obtained from the electrified area. The photographs (Figs. 4 and 5) taken on 15th September are those of the electrified and non-electrified areas in question, and show the *second* crop of clover which had come up on the "hay stubble"; the first crop of clover-

* See this *Journal*, Vol. XXIII, October, 1916, p. 671.

† If the climatic conditions had been favourable the yield of grain would have been still greater, as explained above. Mr. Cameron, who farms the land, estimates the loss from this cause at 10 bush.; if this be accepted, the increase in grain works out at 73 per cent. On a basis of a loss of 5 bush. only the increase becomes 62 per cent.



FIG. 4.—Clover-hay crop of 1916 on electrified Area of 1915.



FIG. 5.—Clover-hay crop of 1916 on control Area of 1915.

hay had been cut in July, 1916. The difference between the growth of the clover on the two areas is very well marked. This question of "after effect" will be investigated in future experiments. It is to be noted that this field had been well limed before the oats were sown.

If, in addition to an immediate increase of the treated crop, the electric discharge may also benefit a succeeding crop, it is obvious that the agricultural value of the application of the discharge becomes very much enhanced.

Problems still Needing Investigation.—Before, however, the use of the overhead electric discharge can be recommended to farmers, more knowledge on many points must be available. The conditions under which the effect is produced—its relation to light, humidity of the air, etc.—have to be studied. The most suitable strength of discharge has yet to be discovered; the experiments suggest that with a greater intensity of discharge still bigger yields might be obtained. The manurial conditions best suited to crop production under the discharge, and the question as to the possible effect of various types of soil, have yet to be investigated. Electrical engineering problems also arise as to the most economical methods of producing the necessary high tension current. There is also the question of the manner in which the electric discharge influences the growth of the crop—a question which is still quite unsolved.

CROPPING A TEN-ROD ALLOTMENT.

A. W. ASHBY.

MANY people who have not previously had a garden are now endeavouring to grow vegetables on an allotment, and some are, naturally enough, puzzled as to what quantities of the different kinds of vegetables it is possible to grow. Many people, also, are in need of guidance as to what quantity of seed to purchase or what the seed should cost. As an attempt to provide guidance for the inexperienced the following plans have been prepared. They are based partly on an assumption that most people will desire to grow several of the simple crops in addition to potatoes, and partly on the expectation that many people will not be able to obtain sufficient seed potatoes to plant more than half their respective allotments with this crop. Thus in Plan I. the ground allotted to potatoes amounts to a little less than half the 10 rods, or just over $4\frac{1}{2}$ rods. This area can easily be increased at the expense of other crops, and,

in particular, in place of peas, for which the ground allotted adjoins the potato patch.

Where manure is not too plentiful, legumes, *i.e.*, peas and beans, are of great value, since they collect nitrogen for other crops ; hence the apparently large area devoted to these crops. After they are removed the ground may be dug and prepared

PLAN I — Cropping a 10 Rod Allotment.

No. of rows.	Crops.	Distance between rows.	33 ft. — Approximate number of Plants	Space Allotted.
3	Parsnips	15 ins.	150	3 ft. 9 ins.
3	Carrots	12 ins.	230	3 ft. 3 ins.
4	Turnips	12 ins.	132	4 ft.
2	Beetroots	12 ins.	66	2 ft.
6	Onions	12 ins.	400 small to 600 medium size.	6 ft.
4	Broad Beans	18 ins.	At 4 ins. 400 At 6 ins. 260	6 ft.
3	Dwarf Beans	18 ins.	99 (or Early Brussels, 36)	4 ft. 6 ins.
2	Runner Beans	3 ft.	At 6 ins. 132 At 9 ins. 88	6 ft.
3	Early Mid Season Late Peas	3 ft.	At 2 ins. 600 At 4 ins. 300	9 ft.
4	Early Potatoes	2 ft.	At 12 ins. 32 per row At 9 ins. 42 per row	8 ft.
4	Second Early Potatoes	2 ft. 6 ins.	At 12 ins. 132 (Brussels Sprouts, 16 per row.)	10 ft.
8	Main Crop Potatoes	2 ft. 6 ins.	At 12 ins. 32 per row At 15 ins. 26 per row At 18 ins. 22 per row (Kale etc., 16 per row)	20 ft.
			Total	82 ft. 6 ins.

82 ft. 6 ins.

for the small seeds of the following season, and for the second year the potatoes may be removed to the other end of the allotment, while the legumes should be removed to the patch now set out for potatoes. If a white variety of dwarf or runner beans* can be obtained, and the crop is plentiful, the seed can be gathered and prepared as haricot beans for winter use. The coloured varieties may also be used in this way if no objection is taken to the colour. The preparation consists solely of gathering the pods when they become yellow and drying them in the sun, afterwards stripping the beans and storing in a clean, dry place for winter use.

Many variations of the proposed plan are possible, according to the state of the soil, the time at the disposal of the cultivator, and his taste and experience. No ground has been set out for such crops as spinach, leeks, celery, etc., nor for salad crops, except as regards use of vacant ground between peas and beans. The crops indicated are the staple crops of the garden, and such as may be grown on fairly good soil, with a little care and attention, without any great risk of failure. With good fortune they should yield a more or less continuous supply of vegetables for a small or medium-sized family during the greater part of the year.

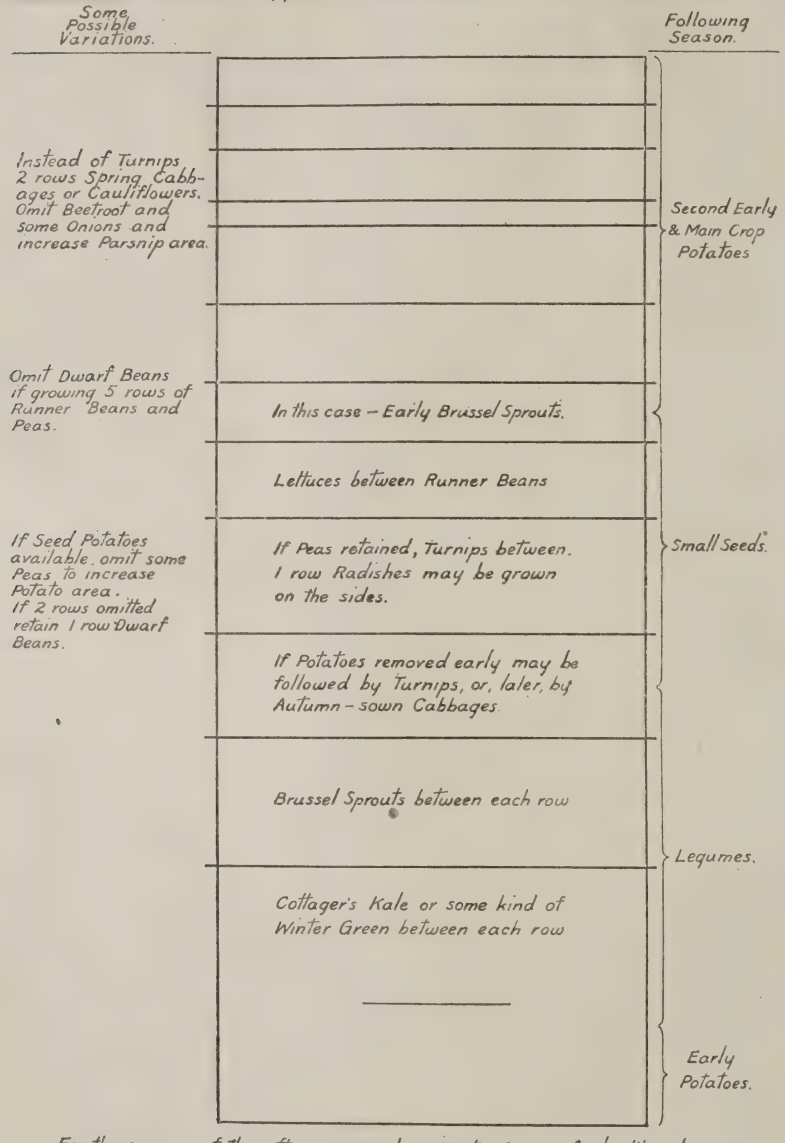
The space allotted to onions may appear too large for many growers, but in working-class families a large number of stews may be necessary. In these the onion is an integral part. This crop may be reduced to 3 or 4 rows as suggested in Plan II., but should not be reduced below 3 rows when stews are an important item in the dietary of the family. With short supplies of imported onions they will be expensive to purchase, and with the necessity for making the best of the meat supplies the produce of 3 or 4 rows will not provide a superabundance. The elimination of 2 rows of onions and the beetroot, as recommended in Plan II., will provide for 3 more rows of parsnips or 2 more rows of parsnips and an extra row of carrots. Where potatoes do not exceed $4\frac{1}{2}$ or 5 rods an addition to the parsnip area is strongly recommended, since, with the exception of potatoes, this crop produces greater weight and food value than almost any other crop which can be grown for winter use.

With the omission of a little space on the border of some of the beds room may be found for 2 or 3 bush marrow plants, or plants of the trailing variety may be set at the end of the space

* *White Dwarf*: Early White or Brewer's White, White Dutch, Dutch Long Pod, Early Dwarf Dutch, American White, and Haricot Suisse. *White Runners*: Large Running White, White Long Pod, Large White Sugar, and Sabre.

intervening between peas or beans. If other vegetables are plentiful during the summer the marrows may be allowed to ripen, when with proper care they will keep till the early months of winter.

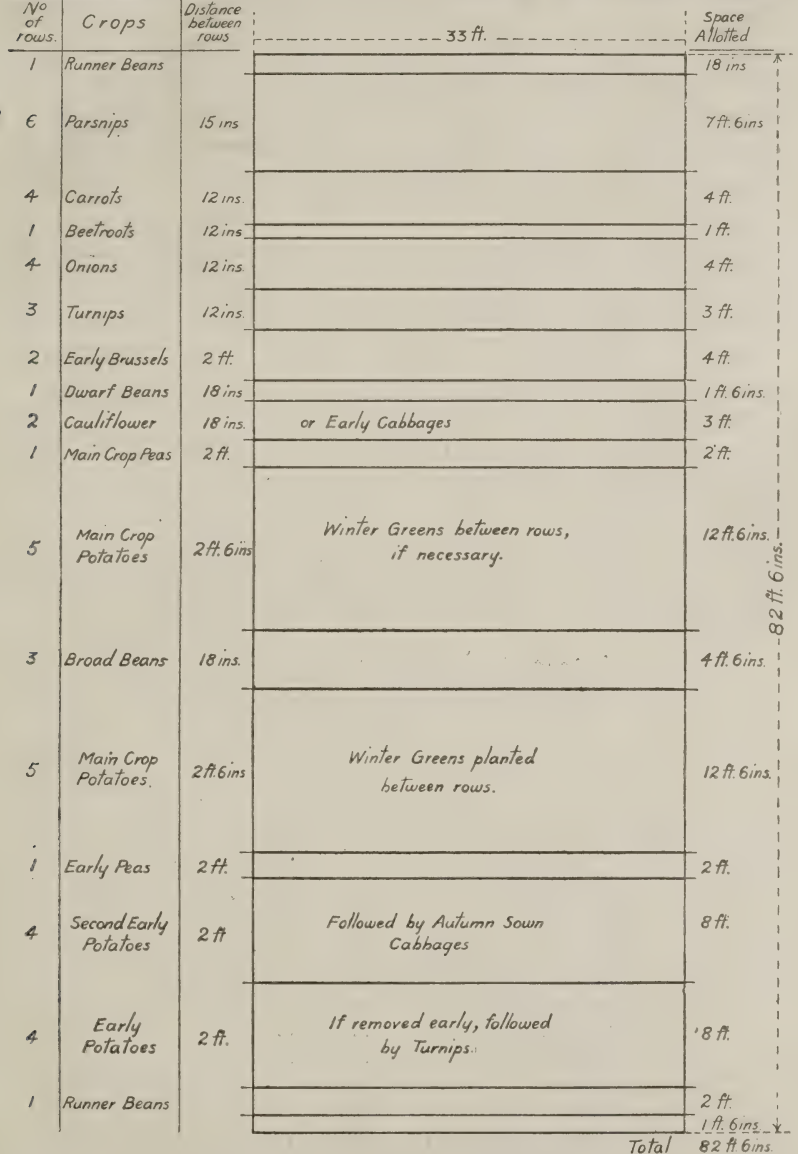
PLAN II — Between Cropping or after Cropping of a 10 Rod Allotment.



For the success of the after crops such as Winter Greens, fairly liberal manuring will be necessary. Two loads of heavy dung applied before first planting would be sufficient, otherwise some fertiliser would be required after removal of potatoes.

Expert gardeners may object to the plan outlined as regards the location of the space provided for peas and beans. The appearance of the allotment would certainly be better balanced if these crops were distributed over the plot—for example, 1 row of runner beans adjacent to each end, and 1 row of peas

PLAN III.— Elaborated Plan of Cropping a 10 Rod Allotment.



Ground occupied by Potatoes, approximately 5 Rods

about 10 yd. from each end, with the broad beans somewhere near the middle of the plot. There is some advantage to the crops themselves in this open system of planting, for yields increase with the amount of air and light available for each row. Wherever it is possible to arrange for these crops to be planted in the direction north to south they yield much better, runner beans especially benefiting from this arrangement. Where, however, the plot is not laid out so that this becomes the general direction for all rows, most gardeners prefer not to disarrange other crops to provide for this direction for peas and beans. The open system of planting is indicated in Plan III. The objection to this treatment is that where manure is not plentiful the value of rotation—following legumes by next year's small seeds—is not obtainable.

This plan is not intended in any way as a hard and fast rule of cropping. It is drafted simply as a guide to what quantity of crops it is possible to grow on the space of a 10-rod allotment. A word of caution is, perhaps, necessary as to the distance between rows of the various crops. On heavy soil, where it may be necessary to hoe frequently, or where big crops of weeds are expected, it may be desirable to increase the distances given in the plan for small seeds, thus reducing the total number of rows.

For the following estimate of the cost of seeds and plants necessary for the plots indicated the writer is indebted to Mr. Arthur Rowles :—

Seeds and Plants required for a 10-rod Allotment.
(Including some dual cropping.)

First Planting.	*Length of Row, 33 ft.*	1917. *Estimated Cost.* s.	d.
3 rows	Parsnip seed	0	2
3 ,,	Carrot ,,	0	3
4 ,,	Turnips ,,	0	3
2 ,,	Beetroot ,,	0	3
6 ,,	Onion ,,	0	9
	Or plants, per score	0	4
	(2 rows plants, 40, 10*d.*) (4 rows seed, 6*d.*)		
4 ,,	Broad beans	0	7
3 ,,	Dwarf ,,	0	8
2 ,,	Runner ,,	0	9
3 ,,	Peas	1	8
4 ,,	Early potatoes	3	6
4 ,,	Second early potatoes	3	6
8 ,,	Main crop potatoes	6	0

Variations or following Crops.			s.	d.
2 rows	Cabbages	(per score 3*d.*)	0	6
	Or Cauliflowers	(„ 3*d.*)	0	6
2 „	Early Brussels	(„ 2½*d.*)	0	5
2 „	Lettuces	(„ 3*d.*)	0	6
2 „	Radish seed		0	2
6 „	Turnip „		0	4
	Or cabbage plants, 4 score		0	10
4 „	Brussels plants, 3½ score		0	7
4 „	Winter green plants, 3½ score		0	7
4 „	Autumn-sown onion seed, if desired		0	5

It would be possible to indicate the yields which might be expected from the space allotted to each crop, but in view of the diversity in the soils and the experience of cultivators this is not considered desirable, as ill-founded hopes might be raised by such estimates. The plan and variations should provide a guide for inexperienced cultivators ; and with care and the best use of facilities yields will be found more than sufficient compensation for the trouble incurred in their production.

Manures, etc.—A few notes on fertilisers and common materials, some in the nature of waste, which are of use on allotments may also be of assistance.

Dung is the best all-round manure for garden purposes, and may be applied at the rate of 10 cwt. and upwards per 10 rods. This quantity is equal to 8 tons per acre, and from 1 to 2 tons, according to the state of the soil, will be found to be a useful dressing on an allotment of this size. Dung varies considerably in weight according to its origin. Light stable manure may not weigh more than 8 or 10 cwt. per cart-load, while rich cow or pig manure may weigh 15 cwt. upwards. Two loads of stable manure will provide a fair dressing for 10 rods, and 2 loads of the heavier manure will be a heavy dressing.

Lime.—Heavy, clay soils and sandy soils will benefit by a dressing of lime. This may be applied at the rate of 2 to 5 bush. per 10 rods. Lime is best applied before the crop is planted. Thereafter it may be sprinkled on the top of the ground in small quantities as a check to slugs, snails, etc. *Fresh gas-lime* is injurious to vegetable life, and when used should be applied some weeks (say 2 months) before planting. About 7 lb. per rod is a useful dressing, and will be found to be a good insecticide.

Artificial Manures.—There are many kinds of artificial manures which are normally used as substitutes for, or in addition to, natural manures. These are classified in three

main groups according as they contain large quantities of (1) *nitrates*, (2) *phosphates*, (3) *potash*. The gardener may take as a guide to their use the principle that nitrates produce fine, luxuriant foliage, *e.g.*, they are useful for the cabbage and similar crops; phosphates induce earlier production of fruit and flowers, and will be found most useful with beans and peas amongst the vegetable crops, although they may be useful with such crops as turnips, parsnips, etc.; while potash increases the substance and improves the quality of fruits, tubers and roots, and will be found very useful with potatoes.

Guano has been the best all-round artificial fertiliser for garden purposes, as it contains all three of the plant foods mentioned in the last paragraph. Now that it is practically unobtainable pigeon and poultry dung are good substitutes, and allotment holders who can obtain these should take great care of them. They contain all three of the chief plant foods in varying quantities, pigeon dung being especially rich. This may be applied at the rate of 4½ to 7 lb. per rod (or approximately 6½ to 10 cwt. per acre), the heavier dressing being given when available. To ensure equal distribution it may be mixed and pulverised with some fine, dry material, such as earth-ashes or very fine coal-ashes. This also applies to poultry dung, which should be applied at the rate of 7 lb. and upwards per rod.

Soot is a useful nitrogenous manure, and in some cases, as when fine ashes are naturally intermixed, contains small quantities of potash and phosphates. On the other hand, the admixture may be valueless, so that in purchasing, the pure, light soot should be sought. Quality may be judged by lightness, and a good sample should not weigh more than about 28 lb. per bush. It may be applied at the rate of 2 bush. per 10 rods, or up to 7 lb. per rod. Soot is very valuable as an insecticide, and may be dusted round plants to ward off slugs, beetles, etc.

Wood Ashes contain considerable amounts of potash and will be found very beneficial to potatoes. As these are usually available only in small quantities, about 4 lb. per rod should be applied, the quantity being increased if the supply is plentiful.

Coal Ashes are not recommended unless they are quite free from cinders, however small. In the finest state they contain potash and very small quantities of phosphates, and may be applied to potatoes and root crops at the rate of 28 lb. per rod. When they contain cinders they should not be used, except

perhaps on the heaviest land, where they are of assistance in keeping the soil open. In this case the largest cinders should be removed.

Salt applied at the rate of 2 to 3 lb. per rod acts as a severe check to slugs, etc. It is also useful on beetroots, and, as a light dressing, on onions and the cabbage family.

Basic Slag, a phosphatic manure, will be found very useful on peas, all kinds of beans, and root crops. It should be applied at the rate of $3\frac{1}{2}$ to 7 lb. per rod, if possible before planting. It is a slow-working fertiliser, but in gardens where moisture and humus (decaying vegetable matter) are plentiful it will readily become available for plant food.

Sulphate of Ammonia, a nitrogenous manure, may possibly be obtained. It should be applied at the rate of 1 to 2 lb. per rod, and will be found useful on all crops except legumes. Basic slag and sulphate of ammonia may be more easily obtained by co-operative purchase by a group of cultivators. These two substances should not be mixed.

Waste Substances.—In some localities wool waste, fish meal, meat meal, dried blood, rape dust, bone meal, etc., may be obtainable. In this case local experience may provide information as to use and the quantity to be applied. There are many other fertilisers such as superphosphate, nitrate of soda, kainit, muriate of potash, etc., which cannot now be obtained, or only with great difficulty and expense. A word of warning may be uttered against prepared " plant foods " and fertilisers sold in tins. Many of these are certainly what they purport to be, but even so their cost is often entirely disproportionate to their value to the gardener. When they are not what they purport to be money is wasted. With dung and lime, and perhaps a little soot for top-dressing, the allotment cultivator can prepare his land for most crops.

EXPERIMENTS WITH PEPSIN TO REPLACE RENNET.

D. W. STEUART, B.Sc.

(University College, Cardiff).

IN view of the shortage and high price of rennet, the Agricultural Department of University College, Cardiff, decided to give pepsin a trial. A London firm kindly sent 1 oz. of their 1-3,000 soluble pepsin powder for that purpose. From this it was desired to produce a solution which would be as similar

as possible in composition and strength to standard rennet extract, which could be used in exactly the same way as rennet, and which would keep. A 10-oz. dark-coloured bottle (a "poison" bottle from the druggist's) was thoroughly washed and scalded, then allowed to cool, and the 1 oz. of pepsin powder put into it. Then 50 grammes of salt, 5 grammes of boric acid, and 250 grammes of water were brought to the boil in an Erlenmeyer flask (water and salt often contain germs, so this treatment was necessary). The brine was cooled to 105°F., put into the bottle, corked with a new cork, the whole shaken violently, and then, without any preliminary filtering, sent to the dairy to be tested. Miss Annie Pritchard, N.D.D., reported as follows: The solution gave a 17–18-second rennet test as against 22 seconds with rennet extract. On standing a sediment settled. When shaken up for use the solution was very cloudy. The pepsin solution was tested against rennet on four different days for making Caerphilly cheese. The pepsin acted in about 7 minutes, and the curd was ready to cut in 45 minutes; the rennet acted in about 15 minutes and the curd was ready to cut in an hour. Even then the pepsin curd was always the firmer when cut. Taking the four tests together, 16½ gal. of milk gave 18 lb. 9 oz. of curd with rennet, but 19 lb. 11 oz. of curd with the pepsin. The pepsin curd was therefore moister, due to the curd being firmer when cut. What remained of this unfiltered pepsin solution at the end of two months gave even a quicker rennet test, proportionately, than when it was new, showing that it had become somewhat stronger.

The solution was examined bacteriologically at the end of the first month. To three Durham's tubes containing MacConkey's litmus, lactose, bile salt, and peptone water, 1 c.c., $\frac{1}{10}$th c.c. and $\frac{1}{100}$th c.c. of pepsin solution were added, respectively, and the tubes were incubated two days at blood heat. There was no evidence of gas-producing coliform organisms. Then similar quantities of the pepsin solution were added to tubes of whey agar, plates were poured, and incubated three days at 37°C. Not a single colony of germs developed, suggesting that the solution was almost or quite sterile.

A second ounce of soluble pepsin powder was purchased for 1*s.* 9*d.*, and made up as before, but in the following proportions: 1 oz. pepsin, 68 grammes salt, 7 grammes boric acid, and 340 grammes water.

The whole was shaken violently. Next day the shaking was repeated. On the second day the solution was filtered

through filter paper. The filtering took about 24 hours. The fluid was bottled as before and sent to the dairy.

Miss Pritchard's report this time was to the effect that the solution was fairly clear and showed no sediment. It gave practically the same rennet test as the rennet. It was compared with rennet for making Caerphilly, Smallholder and soft cheeses (Bondons, Pont L'Evéques, and Coulommiers). The results were entirely satisfactory, the pepsin solution and rennet being of equal strength and having the same effect.

A pair of Caerphilly cheeses made on 20th February, each from 2 gal. of milk, were sampled on 8th March. The two cheeses differed in weight only by an ounce. There was practically no other difference between the pepsin and the rennet cheese. The first batch of Caerphilly cheeses was sold to Mr. Richard Thomson of the Direct Trading Company at 160*s.* per cwt., the then ruling price for first quality Caerphilly. On the 22nd of March, Mr. Thomson examined the cheeses and considered all of them to be entirely satisfactory. Three pairs of cheeses made on 28th February, 1st March, and 6th March, respectively, were selected, and it was explained how they differed. Mr. Thomson was unable to detect any difference between the rennet cheese and the pepsin cheese of each pair.

The trials suggest that a gallon of rennet solution of standard strength can be made by mixing the following ingredients :—

13⅓ oz. of the firm's 1-3,000 soluble pepsin powder ;
2 lb. salt ;
3 oz. boric acid ; and
1 gal. water.

The brine must be cooled to 104°F., after boiling, before dissolving the pepsin. The solution may be filtered after a day or two. It will keep well. With pepsin at 22*s.* per lb., a gallon costs 18*s.* 6*d.* The makers claim that 1 oz. of pepsin powder will curdle 300 gal. of milk. This is quite correct. It takes 12 oz. of standard rennet extract to equal 1 oz. of pepsin powder.

FORESTRY WORK FOR WOMEN:

RAISING FOREST-TREE SEEDLINGS.

MARY SUTHERLAND.

(*Senior Forestry Student in Charge of the Forestry Seed-beds at Aber, North Wales.*)

To make provision for planting operations after the War, the Board of Agriculture have sown large quantities of forest-tree seeds. The following is an account of the work at one of the nurseries, and indicates one type of forest work which may be carried out successfully by women's labour :—

A centre was established in the spring of last year, under the control of the Department of Agriculture of the University College of North Wales, Bangor, on the College farm at Aber, and for the greater part of the work female labour alone was employed.

The site chosen for the seed-beds was a field of about 2 acres, close to the shore of the Menai Straits, and quite unsheltered from sun and the prevailing west wind. The field, of which the soil was a moderately light loam, was ploughed, and harrowed in early spring, but if more time had been available would have benefited by still further cultivation.

The area was then measured out into seed-beds, these being 4 ft. 6 in. wide, with 1 ft. 6 in. paths between each bed. The beds were of a length varying with the shape of the field, the longest averaging 60 yd.

Several means of building up the beds were tried, and the method finally employed was that of taking out all the stones into the pathway, thus utilising them to harden the paths, and at the same time saving the labour of carrying away the stones.

The beds were brought to the necessary fine tilth by repeated raking over, and basic slag was raked in at the rate of about 10 cwt. per acre. This was followed, in the second week of May, by the sowing of the seed, this operation having been delayed by the bad weather.

Drills across the beds were marked out by means of a heavy wooden roller, of the same width as the bed, and having laths 2 in. wide affixed to the surface at intervals of 6 in. When drawn lengthways down the bed the roller left furrows 2 in. wide for the reception of the seed. The seed was sown evenly in the furrows, either from a seed-horn, or equally satisfactorily from an improvised horn made from a large glass bottle, having

a wedge cut out of the cork, just large enough to allow for the passage of a few seeds at once. The seed was first coated with red lead to prevent it being eaten by mice and birds, and sowing was only carried out in fine weather when the soil was in a dry, friable condition suitable to receive and hold the seed. After distribution, a Spitzenberg drill roller was taken over each drill to cover the seed, and the whole operation was completed by drawing a light, wooden roller over the bed lengthwise to consolidate the surface.

A series of smaller beds was tried, the beds being formed by ploughing single furrows 1 ft. apart, to serve as paths. In the beds thus formed, seed was sown broadcast. These beds eventually entailed waste of land, as in subsequent weeding operations in wet weather they were gradually submerged into paths. In dry soils this method would probably bring failure through inability to conserve enough moisture in the seed-bed.

Seedlings of Norway Spruce, which was the first species sown, were through the surface about a month later, a month being the average time of germination of all the species, except Douglas Fir, which took considerably longer, delay being due to the spell of dry weather after sowing, and during July. Once the Douglas Fir seedlings had started, however, growth was very rapid, and by autumn the beds showed a crop of good, strong seedlings, though these were fewer in number than the quantity of seed should have produced.

The beds were first weeded when the seedlings were just showing, and the weeding was carried on continually all through the summer. As a rule, hand-picking was the only satisfactory method of cleaning the beds, the seedlings being so very small. The Dutch hoe was used between the rows later on, to prevent a further crop of weeds making headway. Towards autumn, the beds were hoed as often as possible, in order to cultivate the soil between the growing seedlings, and, by preventing caking of the soil-surface, leave it open to weathering. The large area of paths considerably increased the difficulty of keeping the ground clean ; rough hand-picking was periodically necessary until a weed-killer was used, which effectively cleaned the paths at less cost than the labour previously involved.

During the three summer months, on an average 7 girls, and for a shorter time a number of school-children, were employed in tending the seed-beds. The employment of women in this work was eminently suitable, as it required patience, speed, and careful manipulation to carry it out with the minimum amount of damage and loss of seedlings.

Work was done on the seed-beds in all weathers, except extremely wet weather, when satisfactory weeding was not possible: during such wet weather indoor work was provided at the farm buildings. During spring and summer also the workers were engaged at times in helping with other farm work, *e.g.*, potato-planting, hay-making, and harvesting.

After the end of September work ceased on the seed-beds, as weed-growth had slackened, and the condition of the soil remained so wet that disturbance by weeding might have increased the danger from frost-lifting of the seedlings during the winter.

The number of seedlings obtained from the season's sowing was smaller than it should have been, probably owing to rather too thin sowing, and, in the case of Douglas Fir, to the bad germinating conditions prevailing. A light dressing of nitrogenous manure might have been employed to hasten the growth of the seedlings, as was done at other centres. Seedlings produced without forcing, however, were of considerably better quality, and formed hardier plants than those which were forced.

The accommodation difficulty was met by the provision by the Board of Agriculture of a furnished house as a hostel for the workers. Cost of food, and of cleaning and cooking, was shared equally by the inmates.

Work hours were 7.0 a.m. to 5.30 p.m., with half-an-hour off for breakfast at 8.30 a.m., and an hour for dinner at 1.0 p.m. Saturday afternoons were free.

Full arrangements were made for the comfort and well-being of the workers, and all possible help and consideration were given by Professor R. G. White and his staff on the farm.

The following figures show the estimated numbers of the growing stock and the quantities of seed sown:—

Species.	Total Number of Plants.	Number on 1 sq. yd. of Seed-bed.	Quantity of Seed Sown.	
			Total.	Per 100 sq. ft.
			lb.	lb.
Norway Spruce	304,000	159	139	0·8
Douglas Fir	209,000	87	97	0·4
European Larch	34,000	417	10	1·3
Japanese „	156,000	480	20	0·7
Total	703,000	—	266	—

WAR TIME PROFITS.

FARMING *versus* FORESTRY.

P. TRENTHAM MAW.

THERE has been so much discussion as to the profits which farmers are making, that it may be of interest to review the working of a small farm of just under 100 acres which the writer has managed during the last year.

The farm in question comprises about 28 acres of light, arable land, 9½ acres of which consist of very poor, sandy soil, and were at some time or other enclosed from waste heather land. One half the pasture is inferior, but the rest is of good quality. The buildings are inadequate, and the fields are very scattered, some being more than a mile away from others. There is, consequently, much waste of labour. When taken over, the farm, which had been entirely in the hands of a bailiff, was in a very bad state, as may be judged from the yield from the arable land as shown in the valuation at Michaelmas, 1915, thus :—

6¾	acres	under	mangolds	only averaged	3⅓ tons per acre.
8½	,,	,,	potatoes	,, ,,	8¼ cwt. of ware per acre.
11½	,,	,,	oats	,, ,,	22 bush. per acre.

The produce on hand at Michaelmas, 1915, was not sufficient to pay all cash expenses during the year.

It was decided to adopt a rather more up-to-date method of farming, if only for the sake of example, and the results, which show a *net profit of over* 54*s. per acre*, are not altogether disappointing, though very much still remains to be done.

A statement of accounts submitted to the Board gives a detailed financial survey of the year's operations and shows how the profit realised has been arrived at.* The statement shows that the profits were realised almost entirely from the arable land. This result is chiefly attributable to the use of good seed and the application of artificial manures to supplement a meagre supply of farmyard manure.

Crops Grown in 1916.—*Mangolds.*—A yield of nearly 24 tons per acre was obtained from 2½ acres of mangolds, which had formed part of the land under the same crop in 1915. The manures applied per acre were :—

11 loads dung.	4 cwt. superphosphate.
2 cwt. salt.	1 ,, nitrate of soda.

* Certain points call for note : e.g., eating potatoes were valued at £9 per ton and seed potatoes at £4 15*s.* per ton only ; 10 per cent. was deducted for depreciation on the value of the implements and horses ; and the dairy cows were valued on a pre-war basis.—*Ed.*

Potatoes.—2¾ acres of potatoes yielded* :—

7¼ tons best eating potatoes per acre.
1 ton 2½ cwt. "seed" „ „ „
19 „ pig chats „ „

The varieties grown were "Up-to-Date," "British Queen," and "King Edward," and the seed was obtained from Scotland

The manures used per acre were :—

11 loads dung.	2 cwt. superphosphate of lime.
¾ cwt. nitrate of soda.	1 load poultry manure.

The crop was grown on the best of the arable land.

Rye.—7 acres of rye were grown after oats, but the crop was very inferior. The seed was sown very late, and 2 acres were an absolute failure owing to defective drainage; 1 cwt. of nitrate of soda was applied per acre.

The crop threshed out at only 19¼ bush. per acre on the 5 acres. There is little doubt that the result would have been much better if 3 cwt. of superphosphate per acre had been applied in addition to the nitrate of soda, and if the seed had been sown in reasonable time. The field was in a very poor condition.

Oats.—The most interesting crop on the farm was one of oats grown on 7 acres of extremely poor sand and gravel. The area was at one time part of the adjoining heather moor which looks about as unpromising for agricultural operations as any land could do. There are no records of previous crops, except that of the preceding year, viz., potatoes. For this crop part of the land was dunged, but the yield of eating potatoes was less than the amount of seed used. However, this unfortunate result was partly due to the ravages of rabbits. In the spring of 1916 the area was fenced in, and the oats sown. The land was manured with :—

5 cwt. waste lime per acre, and 4 „ superphosphate	also, *part* received about 10 loads of dung per acre, and the remaining part ¾ cwt. of nitrate of soda per acre.

The crop threshed out at just under 40 bush. per acre; the yield would have been greater had not considerable damage been sustained at harvest time.

Adjoining this area, on one side, is a plantation of Scots Pine which is, according to the writer's yield tables, approximately "Quality II" for Scots Pine.† The results achieved upon the land under the plough afford one of many proofs, coming

* The area on which these yields are based includes vacant land taken up by headlands.

† P. T. Maw's "Complete Yield Tables for British Woodlands."

within the writer's experience, that such land had far better be devoted to husbandry than afforested.

Comparison of Yield from Oats and Scots Pine.—It is a fact worthy of note that the 7 acres of oats yielded in one season a net profit, after deducting £1 per acre for rent, of approximately £7 10*s.* per acre. The neighbouring area under Scots Pine, even with the present abnormal prices of timber, and even had it been ideally managed, could not, at 4 per cent. interest, yield an equivalent rent of more than about 7*s.* per acre; that is, about one-twenty-fourth part of the profits obtained under the plough for the year in question.

It is not possible in this note to discuss further the interesting question of farming *v.* forestry, but, after considerable experience and investigation in this matter, the writer is convinced that in England and Wales the greater part of the more or less waste land, upon which a small profit might conceivably be made by afforestation, would yield a much greater profit if properly farmed. Little is known, as yet, of the agricultural capabilities of waste land if properly farmed, but the writer has seen a crop of nearly 8 tons of potatoes per acre lifted upon waste heather land, within 18 months of being broken up, and for which, previously to being broken up, no land agent could have asked a rent of more than 3*s.* per acre (except as accommodation land near a town). On the other hand, the writer has completed the sale of ideally-grown Scots Pine on similar land within 300 yards, and which, there is ample evidence to prove, never yielded even 1*d.* per acre rent, if calculations are made at 4 per cent. interest.

So, also, in Wales, land has been inspected on which oats, swedes, potatoes and "clover seeds" are grown at nearly 1,300 ft. elevation, and which must certainly yield a far greater profit than will ever be obtained from a well-managed larch plantation adjoining.

Live Stock on the Farm.—There were 11 cows when the farm came under the writer's management. Most of them were inferior, the average milk yield for the previous year being 513 gal. During the year the 4 worst cows were sold, and the remaining 7 cows gave an average of 541 gal. One cow yielded 915 gal. as against 617 gal. the year before. One heifer was brought into the herd.

The profits from pigs were not satisfactory, but better results are anticipated during the current year, as the whole of the pig stock was got rid of last year, and 6 good yelts obtained, 3 of them being pedigree pigs of an excellent strain.

Labour.—The amount paid during the year for manual labour was £239 5*s.* 3*d.* (48*s.* 4*d.* per acre), which is absurdly high, having regard to the work done; no charge, however, has been made for general management.

Capital Employed.—The capital necessary to work the farm was approximately £1,000 (£10 per acre), and the net interest earned for the year was 29 per cent.

THE following Note has been communicated to the Board by Mr. W. W. Glenny :—

The Cultivation of the Leek.

When onions are realising such high prices as at present one is naturally led to consider whether any other member of the *Allium* family, having similar qualities, would make a fair substitute, and impart a like flavour. The onion is used widely in the preparation of soup; and in spring or winter the leek makes a splendid substitute for this purpose, almost unequalled when skilfully used.

In the south of England the leek is not so much appreciated as it is in Scotland, in Wales and in France. It is a fine vegetable where it is thoroughly understood, and when well treated there is nothing of its class that can surpass it in flavour and wholesomeness. The leek is very hardy, and this is probably one reason for its popularity in climates which are liable to severely cold weather.

It seems to have been the only plant of the *Allium* tribe known in England in pre-Saxon times, and it is probably from the fondness of the Celtic tribes for this esculent that their descendants, the Welsh, still retain it as an emblem of their nationality. The *leac*, or *leak*, was also an important table vegetable amongst the Anglo-Saxons, for they called their gardens "leek gardens" (*leac-tun*) and the gardener was a "leekward" (*leac-weard*). As other species of the same tribe were introduced, they were also called leeks with a prefix denoting some peculiarity. Garlic was anciently *gar-leac*, the leek with a spear (*gar*) from the spear-like stem and head of the seed vessel; and an onion was *cnne-leac*, or one-leek from its not throwing off side bulbs. Thus it appears that *leac* or *leak* was a general name for a certain kind of herbs.

Large breadths of leeks are grown in France, in the neighbourhood of towns, and on the borders of the river Seine, as they are much valued by the French, who study cookery more than most nations. The writer saw a large plot from the top of the Château at Boulogne, and, asking what it was in the

distance, was told "pour la soupe," the guide considering the reply readily understood, so much are leeks used in France to make soup.

There are many varieties of leeks, with varying reputations, and among them may be mentioned the following, viz., the London Flag, Musselburgh, Carentan, Rouen, Emperor, Lyon, Renton's Monarch, Sutton's Favourite, Dobbie's Prize, etc. The Musselburgh and Lyon are those mostly grown in Great Britain. The characteristic of hardiness is most important, as the leek that stands a severe winter is the most reliable. Rouen, Musselburgh and Carentan are worthy of notice, as especially excelling in this respect.

A moist, rich soil suits leek cultivation, and it flourishes in the valley of the Thames or on low-lying ground of marshy character. In market-garden culture it is well to sow a large seed-bed in March and a successional one in April. About 10 lb. of seed would suffice to sow an acre of ground. The price of seed is about 8*s*. to 10*s*. per lb. The seed may be sown broadcast, or may be drilled; in the latter case the rows should be 12 in. apart. As land is cleared of early summer crops, the surplus plants may be transplanted to the vacant ground, leaving in the seed-bed a fair crop about 6 to 8 in. apart from plant to plant. In the Musselburgh district in the Lothians the leeks are never drilled, but are transplanted, or *lined*, to use the local term, from seed-beds on to ground from which spring cabbages or early potatoes have been cleared. Plants remaining in the seed-bed will be ready for market before the transplanted ones, and if they are well cared for by dressing them with 60 bushels of soot or 2 cwt. of nitrate of soda, followed by thorough hoeing, they will make a fair sample. A great quantity may often be bunched off a seed-bed, as the plants stand thickly on the ground, and more leeks may be lifted from a rod of seed-bed than froma transplanted plot of the same area, since in the latter case the leeks are set out at regular distances. A bunch may contain 5, 7 or 9 leeks, according to size, and the bunches are made flat.

Before planting out it is usual to lay the plants evenly together, then with a spade strike off some of the long foliage, as it would never lift up again, and would only be a drag on the plant.

Formerly it was customary to stir the soil among the transplanted crop with a long-handled hoe with an 8-in. blade, but better work is done with a short-handled hoe having a 5-in. blade, as the workman can move the ground closer to the plant and thus give it more air and allow the rain to circulate

where it is really needed. Naturally, the latter plan costs rather more, but the work is more efficiently executed, as the operator is nearer his task and moves the soil round the stem of the plant without fear of cutting it off

Leeks are generally washed before they are marketed, as then the bleached portion shows up more effectively. For exhibition purposes, leeks are frequently placed in a small trench, and the rows placed wider apart ; the soil is then drawn to them, so that a larger part is blanched, and the bunched plants look very attractive. In growing leeks for profit, however, the usual method is to plant on the level, as a larger amount of produce is thus obtained.

Leaf Spot of Celery.

THE "Leaf Spot" or "Blight" of Celery (*Septoria apii*, Chester), a disease which has been greatly on the increase during recent years, is usually overlooked until the plants are mature, when the damage done is often so extensive that serious financial loss results.

Description.—The disease is first recognisable by the presence on the foliage of small, discoloured areas, which increase in size and number until the whole leaf becomes of a dirty greenish-brown colour, and finally rots or withers away (Fig. 1). The outer leaves are first attacked, but the disease rapidly passes to the leaf-stalks and heart-leaves, and the whole plant becomes worthless. If the brown disease areas are carefully examined very minute black points may be seen clustered together (Fig. 2). These serve to distinguish blight from the commoner disease caused by the Celery Fly (see Leaflet No. 35). In the latter case the internal tissues of the leaf are devoured by a leaf-mining maggot, which, if searched for in the early stages of the disease, will be found between the upper and lower surfaces.

Celery blight is caused by a minute fungus known as *Septoria apii*, consisting of very fine thread-like strands invisible to the naked eye. These fine threads, or mycelium, live in the tissues of the leaves, robbing them of their food substance, and finally causing their death. The fungus then begins to reproduce itself by forming myriads of long, narrow spores, so minute that many hundreds, and perhaps thousands, are contained in each of the minute black bodies mentioned above (Fig. 3). In moist weather these spores ooze out from the black spore-case through an apical pore, often in the form of a worm-like or tendril-shaped mass which may be seen with the help of a lens, and they are then washed away or scattered



FIG. 1.



FIG. 2.

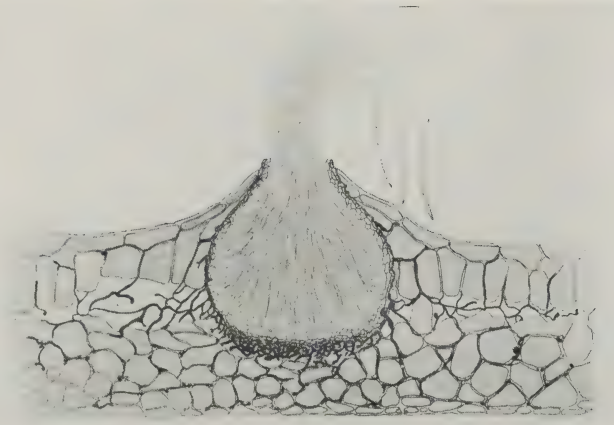


FIG. 3.



FIG. 4.



FIG. 5.

For Description of Figures see text.

by rain. When a spore falls on a celery leaf, which afterwards remains damp for a few hours, it germinates, and gives rise to tiny threads which grow into the leaf, and, after about six to nine days, produce a leaf spot. In about another week this spot will have enlarged and turned brown and have developed clusters of black dots, which are the spore-cases of the fungus containing a second crop of spores. Thus in about a fortnight a single spore may give rise to myriads of other spores, each of which is capable of producing myriads more, until the entire field of celery is reeking with the disease.

If diseased celery refuse is left in the field to rot, the soil becomes infected with the fungus spores ; and in the event of celery being again planted the following year the splashing of rain on the soil will carry the spores to the leaves and a diseased crop will almost inevitably result.

A much greater danger than this, however, lies in the use of infected seed. If diseased plants are allowed to go to seed, the fungus attacks the fruits, and, since commercial celery seed really consists of half fruits, it follows that the seed becomes affected and carries with it the germs of the disease. Recent investigations have shown that 90 per cent. of commercial seed samples contained the fungus. Infected seeds give rise to diseased seedlings (Fig. 5), which, if planted out, serve as a centre from which the disease rapidly spreads in all directions.

Methods of Control.—Although so widespread and destructive there is no reason why celery blight should not be eliminated from this country, and the adoption of the following methods of treatment would help very largely to accomplish this :—

1. In purchasing celery seed the dealer should be asked to guarantee in writing that the seed offered for sale has been examined by a competent expert, and has been found to be free from the disease.

2. In order to facilitate this, the Board are themselves prepared to undertake the examination of seed and to furnish a report. Persons who wish to take advantage of this arrangement should forward samples, which should contain not less than 100 seeds, to the Secretary of the Board of Agriculture and Fisheries, Horticulture Branch, Craven House, Northumberland Avenue, London, W.C. ; together with a fee of 1s. for each sample sent. In each case the sender must state the name of the variety of celery, and the source from which such seed has been, or is proposed to be, obtained.

3. If such a guarantee cannot be given, all seed previous to sowing should be steeped for a period of three hours either in

hydrogen peroxide or in a dilute solution of formalin (1 part of commercial formalin in 600 parts of water). This treatment kills the fungus on the seeds, but does not injure their power of germination, and a crop of healthy seedlings can be obtained.

4. The spores on seed two or three years old are usually dead, and the use of old seed if of good germinating power is, therefore, to be advised.

5. If the disease appears in the crop, steps should at once be taken to eradicate it, but in order to make this possible the blight must be recognised early. Holding a leaf up to the light and looking through it greatly facilitates the recognition of the dark diseased spots in their early stages and the first appearance of the disease on the plants. If only a small number of plants are grown diseased leaves should be picked off at once, and badly-attacked plants dug up and burned. If possible, spraying should also be resorted to.

6. Either Bordeaux or Burgundy mixture should be used for spraying; at least two and, if the attack is severe, three or four applications at intervals of two or three weeks should be given. (For the preparation of these spraying mixtures see Leaflet No. 23). The spraying should be carried out in dry weather.

7. A top dressing of sulphate of ammonia or other stimulating manure applied at the same time will also be of assistance.

8. All diseased refuse should be burned; on no account should it be left lying on the land or allowed to reach the manure heap.

9. If sufficient land is available it is very desirable that the rotation should be so arranged that no land bears celery two years in succession.

10. As the spores are only exuded and can only attack the leaves when the latter are damp, conditions favouring dampness, such as poor drainage and close planting, should be avoided.

11. Working amongst the plants whilst they are wet with dew or rain should also be avoided, as the spores of the fungus are liable to be distributed along the rows on the clothes and tools of the worker.

DESCRIPTION OF PLATE.

FIG. 1.—Celery plant, showing a bad attack of Leaf Spot.

FIG. 2.—Part of a Celery leaf, showing diseased areas in which minute specks, or spore-cases of the fungus, containing innumerable spores, may be seen (natural size).

FIG. 3.—Section, through a minute portion of the diseased area, showing the threads (*mycelium*) of the fungus growing between the cells of the leaf, the spore-case, and the long, narrow spores oozing out (much enlarged).

FIG. 4.—Infected Celery fruits, showing the black specks or spore cases of the fungus (much enlarged).

FIG. 5.—Seedling Celery plant with disease in the two seed-leaves, the result of sowing infected seed (enlarged).

Notes on Feeding Stuffs in April:
From the Animal Nutrition Institute, Cambridge University.

Advice to Stock Feeders in the Present Crisis.—It is now two years since these notes began, and it seems advisable to mark the anniversary by a few general remarks on the principles which should govern the use of food on the farm during the present crisis.

Food is required by animals for two purposes. In the first place for maintenance, or, in other words, for making good the wear and tear of the working parts of the body and for providing the energy for the vital functions, such as mastica-

TABLE I.

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of March.																					
		London.			Liverpool.			Hull.			Bristol.			Glasgow.			Leith.						
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.				
Soya Bean Cake	122·3	—			—			—			—			—			—						
Decorticated Cotton Cake	126·3	17	7	6	18	5	0	—			18	15	0	19	0	0	18	10	0				
Decorticated Cotton Meal	126·3	—			—			—			—			—			—						
American Linseed Cake	119·0	18	2	6	—			—			—			—			—						
Indian Linseed Cake	123·1	—			18	17	6	—			—			19	15	0	19	10	0				
Russian Linseed Cake	123·5	—			—			—			—			—			—						
English Linseed Cake	120·1	19	10	0	19	10	0	19	0	0	19	15	0	20	10	0	20	5	0				
Bombay Cotton Cake	65·3	14	15	0	15	5	0	14	15	0	—			—			15	15	0				
Egyptian Cotton Cake	71·9	15	10	0	15	15	0	15	10	0	15	15	0	16	5	0	16	5	0				
Coconut Cake	102·6	16	10	0	—			—			17	0	0	—			—						
Palm Kernel Cake	96·1	15	10	0	14	15	0	—			15	0	0	—			‡16	5	0				
Palm Kernel Meal (extracted)	92·5	—			—			14	10	0	—			—			—						
Ground-nut Cake	145·2	—			—			—			—			18	15	0	—						
English Beans	99·5	17	13	8	19	7	4	17	13	8	17	11	7	—			—						
Bean Meal	99·5	—			—			—			—			19	10	0	—						
Chinese Beans	101·1	Nominal.			—			—			—			—			—						
English Maple Peas	97·2	20	0	0	—			22	15	6	—			—			—						
English Dun Peas	97·2	17	15	7	—			20	0	0	—			—			—						
Calcutta White Peas	97·5	Nominal.			—			—			—			—			—						
American Maize	93·8	16	6	8	—			17	10	0	—			} 17	0	0	16	15	0				
Argentine Maize	94·2	17	5	4	17	0	8	17	10	0	16	16	0										
Maize Meal	86·5	18	0	0	17	10	0	18	12	6	17	0	0	17	16	0	17	5	0				
Maize Gluten Feed	121·6	17	0	0	16	15	0	—			16	10	0	—			—						
Maize Germ Meal	99·2	17	10	0	17	5	0	17	0	0	17	0	0	—			—						
English Feeding Barley	83·0	19	1	8	—			18	15	2	—			—			—						
English Oats	75·4	19	3	4	19	10	0	19	6	8	18	0	0	} —			19	10	0				
Argentine Oats	75·4	19	6	8	18	5	9	—			—												
Malt Culms	69·9	12	10	0	—			11	10	0	11	15	0	13	0	0	13	0	0				
Brewers' Grains (dried)	84·5	14	10	0	—			14	10	0	14	5	0	14	5	0	14	5	0				
Brewers' Grains (wet)	21·1	2	8	0	—			2	0	0	—			—			—						
Distillers' Grains (English)	101·2	14	10	0	14	5	0	—			15	0	0	} 14	10	0	14	10	0				
Distillers' Grains (French)	101·2	14	10	0	—			—			—												
Distillers' Grains (fine selected)	101·2	15	10	0	—			—			—			—			—						
Distillery Mixed Grains (wet)	20·0	—			—			—			—			—			—						
Egyptian Rice Meal	78·7	17	0	0	—			—			—			—			—						
Burmese Rice Meal	78·7	16	10	0	—			—			—			—			—						
Rice Bran	78·7	—			—			—			—			—			—						
Wheat Middlings (coarse)	92·0	13	10	0	—			—			—			16	10	0	15	0					
Wheat Sharps	92·0	13	17	6	14	12	6	14	10	0	14	5	0	14	10	0	14	10	0				
Wheat Pollards	87·0	—			14	5	0	—			—			—			—						
Wheat Bran	77·5	12	10	0	—			14	10	0	13	5	0	15	0	0	14	10	0				
Wheat Bran (broad)	79·9	13	5	0	14	12	6	16	0	0	14	5	0	15	10	0	14	10	0				
Feeding Treacle	60·0	15	0	0	18	10	0	—			—			20	0	0	18	15	0				
Linseed	153·5	*29	0	0	†30	0	0	—			31	4	6	—			30	10	0				
Linseed Oil	250·0	51	10	0	§56	0	0	47	0	0	5s. *per gal.*			—			—						
Egyptian Cotton Seed	108·6	19	0	0	—			19	5	0	—			—			—						
Bombay Cotton Seed	99·6	—			—			—			—			—			—						
Cotton Seed Oil	250·0	53	0	0	§64	0	0	—			—			—			—						
Fish Meal	145·0	—			—			—			—			14	5	0	15	10	0				

* Pure crushed. Uncrushed £1 per ton less.
† Cleaned. ‡ Carriage paid. § In barrels.

tion, digestion, breathing, the circulation of the blood, and the necessary movements associated with life. Rough fodder will suffice for this purpose. For instance, grass or hay of poor quality, or even straw, will suffice to maintain stores.

But the owner of live stock is seldom satisfied merely to maintain his animals. He wants them to produce something —growth, fat, milk, or work. For production of this kind rough fodder is not suitable. It is impossible to fatten an animal on poor grass or hay, or on straw, nor will such materials satisfactorily produce growth, milk, or work.

For production, foods of a more easily digestible type are required, such as corn, meal, cake, good grass or hay, or roots.

Foods may, therefore, be divided into coarse or rough fodders, such as poor grass, poor hay, and straw which are suitable only for maintenance, and more digestible foods, such as corn, cake, meal, good grass, good hay, and roots which are suitable for production.

A rough estimate of the total supply of home-grown and imported feeding stuffs available for live stock in the United Kingdom in 1916, works out at between 70 and 80 million tons of dry food, more than half of which is suitable only for maintenance, only about 23 million tons being good enough for production of growth, fat, milk, or work.

The prospective decrease in tonnage due to war needs involves a considerable reduction in the importation of concentrated foods, which, of course include the most valuable productive foods available to stock owners. This decrease will amount to 10 or 15 per cent. of the total of productive foods, but is not likely to exceed 5 per cent. of the total fodder supply of the country.

Apparently, therefore, there is not likely to be any great difficulty in maintaining, or keeping alive, the live stock of the country, but there will certainly be grave difficulty in producing fat meat, milk and work—in fact, it will not be possible to produce all of them.

It is necessary, therefore, to decide which to keep. The work of the country cannot go on without the working horses. The rising generation cannot grow into healthy men and women without milk. A large proportion of the decreased supply of concentrated foods must, therefore, be reserved for working horses and milch cows. This will leave a very small supply for fattening beef, mutton, pork and bacon, and consumers must resign themselves to eating meat of much less appetising quality than they have been accustomed to eat heretofore.

TABLE II.

LONDON. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	3¼	Maize germ meal ..	3	6¼
Decorticated cotton cake	2	8¾	English beans	3	6½
Maize gluten feed ..	2	9½	Malt culms	3	7
Distillers' grains (English)	2	10½	Argentine maize ..	3	8
Distillers' grains (French)	2	10½	English dun peas ..	3	8
Wheat middlings (coarse)	2	11	Linseed	3	9½
Wheat sharps	3	0	English maple peas ..	4	1¼
American linseed cake ..	3	0½	Linseed oil	4	1½
Distillers' grains (fine selected)	3	0¾	Maize meal	4	2
			Burmese rice meal ..	4	2½
Coconut cake	3	2½	Cotton seed oil	4	3
Palm kernel cake ..	3	2¾	Egyptian cotton cake ..	4	3½
Wheat bran	3	2¾	Egyptian rice meal ..	4	4
English linseed cake ..	3	3	Bombay cotton cake ..	4	6
Wheat bran (broad) ..	3	3¾	English feeding barley ..	4	7
Brewers' grains (dried)	3	5¼	Feeding treacle	5	0
American maize ..	3	5¾	English oats	5	1
Egyptian cotton seed ..	3	6	Argentine oats	5	1¼

TABLE III.

LIVERPOOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	2	9	English beans	3	10¾
Distillers' grains (English)	2	9¾	Linseed	3	11
Decorticated cotton cake	2	10½	Maize meal ..	4	0½
Indian linseed cake ..	3	0¾	Egyptian cotton cake ..	4	4½
Palm kernel cake ..	3	0¾	Linseed oil	4	6
Wheat sharps	3	2	Bombay cotton cake ..	4	8
English linseed cake ..	3	3	Argentine oats	4	10
Wheat pollards	3	3½	Cotton seed oil	5	1½
Maize germ meal ..	3	5¾	English oats	5	2
Argentine maize ..	3	7¼	Feeding treacle	6	2
Wheat bran (broad) ..	3	8			

TABLE IV.

HULL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	1	10¾	Wheat bran	3	9
Wheat sharps	3	1¾	Linseed oil	3	9
Palm kernel meal ..	3	1¾	Wheat bran (broad) ..	4	0
English linseed cake ..	3	2	English dun peas ..	4	1½
Malt culms	3	3½	Egyptian cotton cake ..	4	3½
Maize germ meal ..	3	5¼	Maize meal	4	3½
Brewers' grains (dried) ..	3	5¼	Bombay cotton cake ..	4	6
English beans	3	6½	English feeding barley ..	4	6¼
Egyptian cotton seed ..	3	6½	English maple peas ..	4	8¼
Argentine maize ..	3	8½	English oats	5	1¼
American maize	3	8¾			

TABLE V.

BRISTOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	2	8½	Wheat bran	3	5
Decorticated cotton cake	2	11½	Maize germ meal ..	3	5¼
Distillers' grains (English)	2	11¾	English beans	3	6½
Wheat sharps	3	1	Argentine maize.. ..	3	6¾
Palm kernel cake ..	3	1½	Wheat bran (broad) ..	3	7
English linseed cake ..	3	3¼	Maize meal	3	11¼
Coconut cake	3	3½	Linseed	4	1
Malt culms	3	4	Egyptian cotton cake ..	4	4½
Brewers' grains (dried)..	3	4½	English oats	4	9¼

TABLE VI.

AVERAGE PRICES PER FOOD UNIT.

LONDON, LIVERPOOL, HULL AND BRISTOL.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	1	Egyptian cotton seed ..	3	6¼
Maize gluten feed ..	2	9	American maize ..	3	7¼
Decorticated cotton meal	2	10¼	Wheat bran (broad) ..	3	7½
Distillers' grains (French)	2	10½	Argentine maize.. ..	3	7½
Distillers' grains (English)	2	10¾	English beans	3	7½
Wheat middlings ..	2	11	English dun peas ..	3	10¾
American linseed cake ..	3	0½	Linseed	3	11
Indian linseed cake ..	3	0¾	Maize meal	4	1¼
Distillers' grains (fine selected)	3	0¾	Linseed oil	4	1½
			Burmese rice meal ..	4	2½
Wheat sharps	3	1	Egyptian cotton cake ..	4	4
Palm kernel cake ..	3	1½	Egyptian rice meal ..	4	4
Palm kernel meal ..	3	1¾	English maple peas ..	4	4¼
English linseed cake ..	3	2¾	Bombay cotton cake ..	4	6½
Coconut cake	3	3	English feeding barley ..	4	6½
Wheat pollards	3	3½	Cotton seed oil	4	8¼
Malt culms	3	5	Argentine oats	4	11½
Brewers' grains (dried) ..	3	5	English oats	5	0¼
Maize germ meal ..	3	5½	Feeding treacle	5	7
Wheat bran	3	5½			

TABLE VII.

GLASGOW. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	1	11½	Wheat middlings ..	3	7
Ground nut cake ..	2	7	Maize	3	7½
Distillery mixed grains (dried)	2	10½	Malt culms	3	8¾
			Wheat bran	3	10½
Decorticated cotton cake	3	0	Wheat bran (broad) ..	3	10½
Indian linseed cake ..	3	2½	Bean meal	3	11
Wheat sharps	3	2	Maize meal	4	1½
Brewers' grains (dried)	3	4½	Egyptian cotton cake ..	4	6¼
English linseed cake ..	3	5	Feeding treacle	6	8¼

TABLE VIII.

LEITH. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	1¾	Maize	3	6¾
Distillery mixed grains (dried)	2	10½	Wheat bran (broad) ..	3	7½
Decorticated cotton cake	2	11	Malt culms	3	8¾
Indian linseed cake ..	3	2	Wheat bran	3	9
Wheat sharps	3	2	Linseed	4	0
Wheat middlings ..	3	3	Maize meal	4	0
English linseed cake ..	3	4½	Egyptian cotton cake ..	4	6¼
Palm kernel cake ..	3	4½	Bombay cotton cake ..	4	9¾
Brewers' grains (dried) ..	3	4½	Oats	5	2¼
			Feeding treacle	6	3

TABLE IX.

AVERAGE PRICES PER FOOD UNIT.

GLASGOW AND LEITH.

	s.	d.		s.	d.
Fish meal	2	0½	Maize	3	7
Ground nut cake ..	2	7	Malt culms	3	8¾
Distillery mixed grains (dried)	2	10½	Wheat bran (broad) ..	3	9
Decorticated cotton cake	2	11½	Wheat bran	3	9¾
Wheat sharps	3	2	Bean meal	3	11
Indian linseed cake ..	3	2¼	Linseed	4	0
Palm kernel cake ..	3	4½	Maize meal	4	0¾
Brewers' grains (dried)	3	4½	Egyptian cotton cake ..	4	6¼
English linseed cake ..	3	4¾	Bombay cotton cake ..	4	9¾
Wheat midd'ings .	3	5	Oats	5	2¼
			Feeding treacle	6	5½

It is not generally realised that by far the most abundant supply of productive food has hitherto been obtained from the produce of good grass land. A rough estimate indicates that of the 23 million tons of productive food available during the year about half consists of good grass-land produce. This, of course, the submarines cannot decrease, and it behoves every occupier of such land to make the very most of it, so as to produce from it the maximum of human food and save the cake, corn and meal for next winter. In the present circumstances it is wasteful to use any kind of concentrated food for animals on grass, if it can by any possibility be avoided. This is not the time to use cake for improving grass land, for greater improvement could be more quickly obtained by judicious use of home-produced manures.

Prices.—Changes in price since last month have been very irregular. Wheat offals generally have become cheaper, and

maize dearer, probably because increasing proportions of maize are being used in the preparation of flour. Other feeding stuffs remain at about the same price as last month.

It should be mentioned that the figures for the digestible nutrients and food units in wheat offals have been altered since last month in accordance with a number of analyses reently made, which can be seen in a paper on the subject in the last issue of this *Journal* (p. 1179).

Horses.—Since last month oats have become slightly dearer, and maize very much so, but wheat offals are considerably cheaper. Last month's ration may therefore be altered as follows :—

3 lb. Dried grains.	1 lb. Gluten feed.
5 „ Wheat pollards,	1 „ Linseed cake.
or 6 „ Bran.	

This should be used to replace 12 lb. of oats until the horses are turned out to grass. As compared with oats, this ration is rather deficient in starchy materials, which should be made up by an allowance of 10 or 12 lb. of roots per head per day.

For horses at work in towns a mixture of dried grains, gluten feed. sharps or pollards and oats in equal proportions may be used to replace oats weight for weight.

Milking Cows should still get the ration given last month—2 lb. of decorticated cotton cake and 3 lb. gluten feed—until they go out to grass, when they should require no concentrated food, except perhaps 2 lb. of cotton cake for a short time to prevent scouring.

Cattle Fattening for Beef.—The stall-feeding season is now coming to a close. Those who are finishing their last lots of cattle should refrain from excessive use of cake and corn. Under present conditions the use of more than 3 or 4 lb. per head, even for finishing. can only be regarded as wasteful from the national point of view. During the last month or six weeks before a bullock reaches the stage known as "prime fat," for every pound of fat put on he consumes about 15 lb. of dry food, of which about 4 lb. is cake or corn. By selling for slaughter a month or six weeks before prime condition is reached the final and most wasteful stage is avoided, and considerable saving of feeding stuffs is effected. The farmer may still derive some profit from "finishing" beasts which have reached this stage, because butchers are still willing to give excessive prices for "prime" beef, but it is a practice wasteful of the national resources. and the patriotic farmer will not be a party to it.

Sheep Fattening on roots, etc., should be treated in the same way for similar reasons.

Ewes with Lambs should get the smallest possible allowance of concentrated food. One of the mixtures recommended last month will still be found economical.

Young Stock should go out to grass at the earliest possible opportunity, and should not get concentrated food except in very special cases.

Pigs.—It will be necessary to reduce the number of pigs because the supply of meal on which most pig keepers are

TABLE X.

(1) Name of Feeding Stuff.	(2) Nutritive Ratio.	(3) Per cent. digestible. Protein.	(4) Per cent. digestible. Fat.	(5) Per cent. digestible. Carbo-hydrates and Fibre.	(6) Starch equiv. per 100 lb.	(7) Linseed Cake equiv. per 100 lb.
Foods rich in both Protein and Oil or Fat.						
Ground nut cake	1 : 0·8	45·2	6·3	21·1	77·5	102
Soya bean cake	1 : 1·1	34·0	6·5	21·0	66·7	88
Decort. cotton cake	1 : 1·2	34·0	8·5	20·0	71·0	93
Linseed cake, Indian	1 : 1·9	27·8	9·3	30·1	77·1	101
Linseed cake, English	1 : 2·0	26·7	9·3	30·1	76·0	100
Cotton cake, Egyptian	1 : 2·1	15·5	5·3	20·0	40·0	53
Cotton cake, Bombay	1 : 2·5	13·1	4·4	21·5	37·6	49
Distillers' grains (English)	1 : 2·9	18·7	10·2	29·0	57·3	75
Distillers' grains (French)						
Maize gluten feed	1 : 3·0	20·4	8·8	48·4	87·4	115
Brewers' grains, dried	1 : 3·5	14·1	6·6	32·7	50·3	66
Coconut cake	1 : 3·8	16·3	8·2	41·4	76·5	101
Palm kernel cake	1 : 4·5	14·1	6·1	48·9	76·7	101
Linseed	1 : 5·9	18·1	34·7	20·1	119·2	157
Bombay cotton seed	1 : 6·6	11·0	16·8	30·1	77·5	102
Fairly rich in Protein, Rich in Oil.						
Maize germ meal	1 : 8·5	9·0	6·2	61·2	81·0	107
Rice meal	1 : 9·4	6·8	10·2	38·2	68·4	90
Rich in Protein Poor in Oil.						
Fish meal	1 : 0·1	54·0	4·0	—	60·0	78
Peas, Calcutta white	1 : 2·1	23·3	1·1	45·9	66·9	88
Beans, English	1 : 2·6	19·3	1·2	48·2	67·0	88
Beans, Chinese	1 : 2·6	19·6	1·7	47·9	67·0	88
Peas, English maple	1 : 3·1	17·0	1·0	50·0	70·0	92
Palm-nut meal (extracted)	1 : 3·4	15·6	1·9	48·7	66·1	87
Brewers' grains, wet	1 : 3·5	3·5	1·5	8·6	12·7	17
Malt culms	1 : 3·6	11·4	1·1	38·6	38·7	51
Cereals, Rich in Starch, not Rich in Protein or Oil.						
Barley, feeding	1 : 8·0	8·0	2·1	57·8	67·9	89
Oats, English	1 : 8·0	7·2	4·0	47·4	59·7	79
Oats, Argentine	1 : 8·0	7·2	4·0	47·4	59·7	79
Maize, American	1 : 11·5	6·7	4·5	65·8	81·0	107
Maize, Argentine	1 : 11·3	6·8	4·5	65·8	83·5	110
Maize meal	1 : 13·0	5·5	3·5	63·9	77·8	102
Wheat middlings, fine	1 : 4·8	13·2	3·0	53·8	72·0	95
Wheat middlings, coarse or sharps	1 : 5·1	13·8	4·3	50·5	64·0	84
Wheat pollards	1 : 4·5	11·6	4·0	51·6	60·0	79
Wheat bran	1 : 4·7	11·3	3·0	45·0	49·7	65
Wheat bran, broad	1 : 4·7	11·3	3·0	45·4	48·1	63
Locust bean meal	1 : 22·1	4·0	0·7	69·2	71·4	94

accustomed to feed them is not available. A considerable amount of pork and bacon can, however, be produced by adopting the methods suggested in "Notes" for February and March, which may be summarised as follows :—Wean on the finer wheat offals. Run on grass or other green stuff, with a small allowance of palm kernel cake, coconut cake, beans or peas, until ready to fatten. Fatten on finer wheat offals. By this method pork or bacon can be produced with half the usual consumption of concentrated food.

Notes on Poultry Feeding: *From the Harper Adams Agricultural College.*

THE prices for poultry foods during the past three months have steadied, but locally there has been a greater difficulty in obtaining supplies, and several foodstuffs have in some places been absolutely unobtainable. The proximity to markets, and the possibility of obtaining supplies have, therefore, to be the ruling factors, rather than the price paid for the particular food. Some foodstuffs have, on the contrary, been more readily obtainable, and at reduced prices, compared with those quoted on 1st January last. Fish meal, which at that time was almost unobtainable, has been offered more freely at a reduced price. The prices of the principal feeding stuffs are given on p. 71. In the case of certain other feeding stuffs specially useful for poultry the prices early in April were about as follows :—

Biscuit dust, 15*s.* per cwt. ; fish meal, 17*s.* 6*d.* per cwt. ; rice meal, 20*s.* per cwt. ; and cracked maize, 18*s.* per cwt.

The scarcity of green food, owing to serious damage throughout the country by the repeated frosts and the exceptional spells of cold, dry east wind, has told particularly upon the poultry food ration. Swedes and mangolds have been increasing in price, and the former are now getting short, but mangolds may well be used cut in quarters and given so that full use is made of them without waste.

Household waste and scraps are generally available and should be used to help out the purchased meals and other concentrated foods.

Wheat is a prohibited grain for poultry food, and it is desirable that other grains suitable for human food should not

be used for poultry, so that substitutes should be provided, *e.g.*, tailings, screenings, and damaged grain, though even these are being used for other stock. Damaged barley and oats may be used with cracked maize without any detrimental effect. A trial with barley, oats and maize mixture gave satisfactory results during February and March in the case of four pens of birds, which produced in the two months :—

10 White Wyandottes	.. 397 eggs.	
10 „ „	.. 330 „	(two birds broody).
10 White Leghorns	.. 312 „	
10 Buff Orpingtons	.. 289 „	(three birds broody).

The ration given to the birds was made up as follows :—

Sharps, 12 parts.	Oats, 12 parts.
Bran, 2 „	Barley, 6 „
Fish Meal, 2 „	Maize, 6 „

The bran and fish meal were scalded and dried off with sharps, and this soft food was given in the morning, the mixed grain being given at the mid-day and afternoon feeds. Green food and mangolds were given when available.

The price of eggs, although considerably below that ruling when the last notes were published in January, is still high enough to warrant a full ration, and economy should be practised in directions other than in reducing the food bill until weather conditions allow more outside food to be obtained.

In view of the difficulty of obtaining the various foodstuffs in different localities, the following variations are given for the soft food ration, the hard or grain portion in each case being made up as follows :—

Grain ration, about 2 oz. per bird per day : damaged oats, 2 parts ; cracked maize, 1 part ; and barley or dari, 1 part.

Soft food, amounting to about 2 oz. per bird per day :—

1st.—		2nd.—	
Palm Kernel Meal ..	1 part.	Coconut Cake Meal	1 part.
Rice Meal	1 „	Rice Meal	1 „
Sharps	1 „	Sharps	1 „
Bran	1 „	Clover Meal	1 „
Fish Meal	1 „	Meat Meal	1 „
3rd.—		**4th.—**	
Brewers' Grains ..	1 „	Biscuit Dust ..	1 „
Sharps	1 „	Sharps	2 parts
Rice Meal	1 „	Clover Meal ..	1 part.
Clover Meal ..	1 „	Fish Meal	1 „
Fish Meal	1 „	Malt Dust	1 „

Where the foods will allow the foregoing mixtures may be interchanged with advantage, as the birds will respond to a change in their diet, providing sudden changes are avoided.

Notes on Manures in April: *From the Rothamsted Experimental Station.*

Potash Fertilisers.—A considerable quantity of wood ashes is being produced by the Forestry Corps in their work in woodlands and forests. The ashes contain on an average about as much potash as kainit; whenever the material can be obtained it should be taken at once. It should be carefully stored in a dry place, not exposed to rain, as the potash is in a highly soluble combination that readily washes out.

Army stable manure and seaweed both contain quantities of potash and should be used whenever they can be obtained.

Reference may be made to an article in this *Journal* in November, 1914, where it is shown that the ashes of hedge trimmings, etc., contain about 10 per cent. of potash (K_2O), equal to nearly 20 per cent. of sulphate of potash and worth a good deal at present prices. In the fields there described the cleaning out of the hedge bottoms yielded about 5 lb., and the hedge trimmings yielded about 10 to 20 lb., of ash per 100 yd. of hedge. On this basis a 20-acre field with 1,300 yd. of hedge would give potash altogether equivalent to nearly 2 cwt. of kainit. The ash, however, must be collected at once and not exposed to rain.

In some cases it is not necessary to use potash at all, as a dressing of salt will give the required effect. This is particularly true of the mangold crop. Thus, at Woburn, the following results were obtained:—

Mangolds, Warren Field, 1908.

Produce of Roots. Tons per acre.

Nitrate of Soda	None	1 cwt.	1 cwt.	1 cwt.	1 cwt.	1 cwt.
Salt	,,	None	1 ,,	2 ,,	4 ,,	6 ,,
Sugar Mangolds..	28·0	30·2	31·3	34·4	34·7	33·9
Golden Tankard	19·9	23·4	23·9	29·4	28·9	33·5
Yellow Globe ..	28·2	33·2	34·9	38·0	38·3	41·2
Long Red ..	31·8	26·6	32·3	35·2	36·6	36·6
Mean of four varieties	27·0	30·9	30·6	34·3	34·6	36·3

At the Harper Adams College the results of trials with mangolds in the three seasons 1913-15 were:—

No salt.		*5 cwt. salt after sowing.*		*10 cwt. salt after sowing.*
27½		35¼	..	36 tons per acre.

Not only did the salt increase the crop, as shown above, but it did this without depressing the dry matter or the sugar content of the crop.

In Northumberland, Gilchrist found that an application of 2 cwt. of salt per acre was beneficial, increasing the yield of mangolds by some 4 tons per acre. Milburn and Gaut, in Lancashire, obtained good results from 1 cwt. of salt.

The Central European investigators for some time prior to the War studied the effect of salt on sugar beets to see if the composition of the crop would be adversely affected, and found that it was not. The Austrian investigators, Strohmer, Briem, and Fallada, obtained increases both in yield and sugar content when sugar beet was manured with salt. So also Andreik and Urban, and also Mette, all in Bohemia, found that salt increased the yield without lowering the sugar content; in one experiment the percentage of sugar in the control crops was 20·6, while in the crops treated with salt it was 21·5.

These results may reasonably be taken as confirming those of the British investigators already quoted.

Unfortunately we have no such clear evidence in the case of the potato crop. It is possible that salt would increase the yield, especially where potash is known to be necessary, but there is the possibility that some damage might be done to the quality of the crop. Only a few experiments have been made, and those unfortunately not in this country. Pagnoul, many years ago, found that sodium does not actually get into the tuber, so that no direct injury from this source need be anticipated, but the possibility of indirect effects still remains. Hartwell and Wessels, in the Rhode Island experiments, found that potatoes manured with sodium instead of potassium were less mealy when cooked, and also contained less ash and more nitrogen. Whether the effects would be of any material significance is uncertain. The fact that many growers use kainit for potatoes suggests that salt could be used without likelihood of harm.

On grass land known to respond to kainit dressings of salt may be expected to give good results.

Top Dressings for Hay Land.—In view of possible restrictions in feeding stuffs it becomes highly desirable to obtain as much hay as possible, and for this purpose suitable manurial dressings should be given where possible. Owing to difficulties

connected with supplies it is not possible to suggest schemes of universal application. The following are the facts showing the action of fertilisers on hay crops. The yield of hay on ordinary meadow land may often be largely increased by the use of a nitrogenous fertiliser. The most suitable nitrogenous manures for producing bulk of herbage are nitrate of soda, sulphate of ammonia, and the new fertilisers—nitrolim and nitrate of lime. Many farmers have obtained hay for a number of years simply by applying ¾ to 1½ cwt. of nitrate of soda per acre and nothing else to the land. Sulphate of ammonia also serves for a time, though not so well.

Although this scheme may answer in a particular year, it cannot be recommended permanently because it causes serious deterioration of the herbage. At Rothamsted one of the plots has long received 2½ cwt. of nitrate of soda per acre each year; an average yield of 34 cwt. of hay has been maintained, but there has been a marked falling off in the quality; the clover has decreased, and the weeds have increased so much that they now make up more than 30 per cent. of the whole.

Sulphate of ammonia used by itself produces equally undesirable results. On the average the yield at Rothamsted is practically the same as with nitrate of soda—36 cwt. per acre—though it has not kept up so well in recent years; the clover has entirely disappeared, and the grass is mainly sheep's fescue.

When nitrate alone is used the falling off in quality shows itself in the great variety of herbage and the number of flowers—ox-eyed daisies, scabious, bird's-foot trefoil, hawkbit, and many others appearing along with the delicate-looking quaking-grass.

The cause of this deterioration lies in the fact that neither nitrate of soda nor sulphate of ammonia furnished a complete food for the plant; phosphates are needed also, and on some soils, usually the lighter ones, potash salts as well.

When a complete dressing of artificials is used instead of nitrate of soda, or ammonia salts alone, a higher yield of considerably better quality is obtained; the average results at Rothamsted are:—

	Plot.	*Yield of Hay: Cwt. per acre. Average of 57 years. 1856–1912.*	*Percentage Composition of Hay Samples Taken during 1856–1912.*		
			Grasses.	*Clovers (Leguminosæ).*	*Others (Weeds, etc.)*
Nitrate of soda + phosphates and potash, etc. ..	16	46·3	82·9	5·4	11·7
Nitrate of soda alone	17	33·7	71·0	1·3	27·7

The clovers, etc., do better, and so do the grasses, consequently the weeds become crowded out to a greater extent.

This is further demonstrated in the Cambridge experiments at the University Farm for the seasons 1901 and 1902, when the following results were obtained :—

	Cwt. Hay per acre.		*Increase in 2 years over unmanured.*
	1901.	1902.	
Unmanured	22½	26¼	—
Sulphate of ammonia alone, 2½ cwt. per acre	32½	48	34½
Sulphate of ammonia + 10 cwt. of basic slag	46½	63¾	64¼
Slag alone	32	43	29

The fact that a complete artificial manure is well suited to grass land laid in for hay is shown by the fact that the hay steadily improves as time goes on. Thus at Rothamsted in 1914, a dry year, very unfavourable for hay, the results were :—

	Plot.	*Yield : Cwt. of Hay per acre.*	*Percentage Composition of Hay.*		
			Grasses.	*Clovers (Leguminosæ).*	*Others (Weeds, etc.)*
Nitrate of soda + phosphates and potash, etc.	16	37·5	74·4	15·6	8·3
Nitrate of soda alone	17	23·3	68·4	0·6	30·2

Another instance is furnished by the Garforth experiments over the 12-year period, 1899–1910. A complete mixture of artificials applied every year gave the highest percentage of good grass, and the lowest percentage of weeds. Cocksfoot and Golden Oat were strongly encouraged, while Bent and Sorrel were greatly reduced. The omission of potash only slightly brought down the yield, but affected the quality of the herbage to a greater extent, reducing the proportion of grass, and increasing that of weeds, especially of Sorrel :—

	Plot.	*Yield of Hay : Cwt. per acre.*	*Composition of Herbage.*			
			Grasses.		*Leguminosæ.*	*Others (Weeds, etc.).*
			Good.	*Inferior.*		
Unmanured	1	29½	17·8	59·1	Nil.	18·3
10 tons dung annually	2	52½	43·3	14·3	Nil.	36·8
Complete artificials*	7	42¾	69·6	15·5	0·3	10·8
Nitrate and superphosphates only	9	40½	56·6	12·7	Nil.	24·5

* 1½ cwt. nitrate of soda, 2 cwt. superphosphate, 3 cwt. kainit per acre.

Dung encouraged the good grasses, especially Foxtail and Cocksfoot, and repressed Bent, but it also encouraged Soft Brome—a poor grass—and very considerably increased the proportion of weeds.

The Cockle Park experiments led to the same results. Nitrogenous manures increased the crop, but caused deterioration in the herbage. When basic slag was supplied in addition there was a larger and much more profitable crop. None of the manures tested, however, were as effective as the combination of dungs and artificials,* or as profitable as dung. Thus on the Palace Leas Field the average yields of hay in cwt. per acre for the 18 years 1897 to 1914, and the live-weight gains per week in sheep fed on equal weights of hay during the period November, 1905, to January, 1906, were :—

——	Unmanured Plot 6.	Sulphate of Ammonia alone. Plot 7.	Sulphate of Ammonia and Slag. Plot 10.	Slag and Potash. Plot 12.	Dung (8 tons) and Artificials (2½ cwt.) Plot 1.	Dung (8 tons) alone. Plot 2.
Yield of hay, cwt. per acre ..	19¼	34	31	26¼	42	39
Live weight gains in sheep, lb. per week ..	1·78	—	—	2·26	1·65	2·04
Average annual gain or loss over unmanured ..	—	*s. d.* 5 6*	*s. d.* 5 5	*s. d.* 2 11	*s. d.* 0 1	*s. d.* 9 5
Average annual gain or loss over unmanured when quality is taken into account	—	11 7	9 3	19 11	8 5	23 0

* Loss of 5*s.* 6*d.*

When the complete manure is used it is safe to increase the dressing of nitrate of soda or sulphate of ammonia, and as a general rule the more nitrogenous manure is used the bigger the crop. Whether the increase is profitable depends of course on prices. There is some deterioration in quality ; the tall-growing grasses flourishing so much that they crowd out the weeds. Thus at Rothamsted the results were :—

* The dressings were 150 lb. sulphate of ammonia, 300 lb. slag (or, in some of the earlier years, 400 lb. super.), 100 lb. muriate of potash per acre.

	Yield of Hay : Cwt. per acre. Average. 57 years.	*Percentage Composition of Hay.*		
		Grasses.	*Clovers, etc. (Leguminosæ).*	*Other (Weeds, etc.)*
Nitrate of soda + phosphates and potash ..	46·3 ..	82·9 ..	5·4 ..	11·7
Double dose of nitrate of soda + phosphates and potash, etc. ..	56·9 ..	88·8 ..	3·7 ..	7·5
Equivalent dressings of sulphate of ammonia + phosphates and potash, etc.	54·3 ..	91·2 ..	1·3 ..	7·5

Similar results were obtained in the Yorkshire experiments :—

Manurial Dressings per acre.	*Average Yield of Hay, 1899 and 1900 : Cwt. per acre.*
Unmanured	21·5
2 cwt. superphosphate, 3 cwt. kainit, and no nitrate of soda	25·5
2 cwt. superphosphate, 3 cwt. kainit, 1 cwt. nitrate of soda	32·5
2 cwt. superphosphate, 3 cwt. kainit, 1½ cwt. nitrate of soda	35·0
2 cwt. superphosphate, 3 cwt. kainit, 2 cwt. nitrate of soda..	37·8

The Lancashire experiments also gave similar results. When the amounts of kainit and of superphosphate were increased, however, there were no such increases in the yield of hay. It makes very little difference to the yield whether sulphate of ammonia or nitrate of soda is used, but such advantage as there is lies in favour of the nitrate of soda.

Where the seeds hay has suffered badly owing to inclement weather it may be desirable to plough it up and put the land into roots rather than have it full of weeds. The shortage of hay would then have to be made good by manuring the meadow land on the lines above indicated.

Unit Prices of Artificial Manures in April.—The statement on p. 86 shows the cost to the purchaser of 1 per cent. per ton of nitrogen, and soluble and insoluble phosphates derived from various sources, at certain ports and manufacturing centres, for April, 1917.

NOTE.—These unit prices are based on the *probable* retail cash prices in bags f.o.r. for quantities of not less than 2 tons of the manures mentioned at the ports and places specified, but it should be borne in mind that market prices are fluctuating considerably at the present

UNIT PRICES OF ARTIFICIAL MANURES.

—	England and Wales.										Scotland.	
	London.	King's Lynn.	Hull.	Newcastle.	Silloth.	Liverpool.	Widnes.	Newport.	Bristol.	Plymouth.	Glasgow.	Leith.
Nitrogen from :	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sulphate of Ammonia pure .. (95 %)	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 6	15 6
Sulphate of Ammonia pure .. (93 %)	—	—	—	—	—	—	—	—	—	—	—	—
Calcium Cyanamide (Nitrolim)	20 0	—	—	—	—	—	—	—	—	20 0	—	—
Nitrate of Soda pure .. (95 %)	—	—	28 2½	—	—	29 10	30 6	—	28 4½	27 1	—	29 4¼
Nitrate of Soda pure .. (90 %)	29 4	33 4	34 0	—	—	—	—	—	29 4	29 4	—	—
Nitrate of Lime ..	—	—	—	—	—	—	—	—	—	—	—	—
Castor Meal	—	—	24 9	—	—	—	—	—	—	—	—	—
Allowed for Insol. Phos.	—	—	*2 0*	—	—	—	—	—	—	—	—	—
Allowed for Potash ..	—	—	*15 0*	—	—	—	—	—	—	—	—	—
Soluble Phosphates from :												
Superphosphate 35 %	3 8½	3 1½	3 6	4 0	4 0	4 2½	4 1½	3 5	—	—	—	—
,, 33 %	—	3 2	3 5	—	—	4 3	4 2	3 5	—	—	—	—
,, 30 %	4 0½	3 4½	3 6	3 10	4 1	4 4	4 3	3 5	3 5	3 5	—	4 2
,, 26 %	4 2½	3 8	3 10	4 3	4 5	4 8½	4 6½	3 9	—	3 9	—	—
Dissolved Bones ..	5 7	5 5½	5 2	5 5½	5 2½	5 3½	—	5 9	5 10	5 7	—	—
Allowed for Nitrogen ..	*20 11*	*20 3½*	*19 2½*	*20 3½*	*19 4½*	*19 10½*	—	*21 4½*	*21 8*	*20 11*	—	—
Allowed for Insol. Phos.	*3 4*	*3 2½*	*3 0*	*3 2½*	*3 0½*	*3 1*	—	*3 4½*	*3 5*	*3 3½*	—	—
Insoluble Phosphates (Citric Soluble) from:												
Basic Slag	2 9	2 7½	2 10½	—	—	—	—	—	2 5½	3 7½	3 3½	3 3½
Insoluble Phosphates from :												
Basic Slag	—	2 8½	2 3½	2 0	—	—	1 11	—	2 9	2 9½	—	—
Bone Meal	3 0	3 3	3 0	—	2 10	3 1½	3 2	2 11½	3 1½	3 2½	—	—
Allowed for Nitrogen ..	*19 1*	*20 9½*	*18 11*	—	*18 1½*	*19 9½*	*20 1½*	*18 9½*	*20 0*	*20 5½*	—	—
Steamed Bone Flour ..	2 6½	3 0	2 11½	—	—	—	—	2 4½	2 7½	2 9	—	—
Allowed for Nitrogen ..	*16 4*	*18 11½*	*18 9½*	—	—	—	—	*15 2½*	*16 7½*	*17 6½*	—	—
Fish Guano	—	3 8½	3 1	—	3 7	3 2½	—	—	—	—	—	—
Allowed for Nitrogen ..	—	*23 8*	*19 8½*	—	*22 10½*	*20 3½*	—	—	—	—	—	—
Potash	No quotations.											

time. The prices are published by the Board of Agriculture and Fisheries for use in comparing the commercial values of artificial manures. They may also be used as a guide to the probable price per ton of any of the manures mentioned if the unit prices of the constituents of the manure are multiplied by the percentages of the constituents found in it, and due allowance is made for the difference between cash prices and credit prices, and for cost of carriage from the nearest centre to the place where it is delivered to the purchaser. If used in connection with the valuation of a compound manure regard must be had to the sources of the constituents, and a reasonable sum must be added for mixing, disintegrating, and rebagging the ingredients, bags, and loss of weight.

Economy in the Use of Seeds.

IT is important in the national interest that everyone who is sowing vegetable seeds should exercise economy in order that no more seed should be sown than is necessary. In ordinary times, when seed is both plentiful and cheap, it is often used with a free hand, but at the present time the seeds of many vegetables are neither plentiful nor cheap, and it is, therefore, not only a wise economy but also a duty to make seed go as far as possible.

The following hints will be of use in this connection :—

1. The seeds of many vegetables, especially if they are from a good harvest, retain their germinating power almost unimpaired for several years. This is true, for example, in the case of seeds of leguminous food plants—peas, beans, scarlet runners, French beans, etc. Therefore, before opening this year's seed packets, seeds of these kinds of vegetables left over from last year's seed order should be tested in order to ascertain whether they will germinate well or not. This is very easily done. All that is necessary is to line two saucers with pieces of flannel or with blotting paper and to moisten, but not thoroughly to wet, the flannel or blotting paper. A known number of seeds (20 or 30) should be placed, well separated from one another, in one of the saucers. The other saucer is then inverted on the one containing the seeds, and the saucers are stood in a moderately warm place, and to prevent drying up by evaporation, may be covered with a bowl, jar or newspapers. The germination will be quicker if before the seeds are placed in the saucer they are soaked in water until they have "plumped up"—for example, they may be soaked over night. After a day or two, the saucers being examined

daily, the seeds which have begun to sprout are counted and removed. The rate of each seed's germinating varies very much according to the kind, so that the test must run on for a time, varying from two or three days to ten days or a fortnight. If a fair proportion of last year's seeds germinate they should be sown, and this year's seeds may be kept in their unopened packets for use next year.

2. Seeds should be sown as thinly as possible, but at the same time, it must be remembered that, if sown too thinly, there may be gaps when the seedlings come up.

3. It should be remembered that many seedlings transplant quite well, so that carefully lifted thinnings can be used to increase the number of rows.

4. Care should be taken to ensure that there is no wasteful use of such seeds as those of cauliflower, as the supply will probably be short next year. At the same time, large gardeners should remember that a few dozen seedlings (good varieties) of cabbages and savoys are often a welcome gift to the smaller gardeners in their neighbourhood.

5. In ordinary years the seeds of scarlet runners, broad beans, and peas, ripen perfectly well in this country, and growers may well save a fair amount of seed from their own crop. Anyone who has parsnips, beet, carrots, leeks, celeriac or cabbages sown last year should leave some of each of these, plants in the ground, let them run to seed, and, if they do, seed should be saved. Home-saved seed should, if possible, be protected from birds, and should be allowed to ripen thoroughly, should be harvested when ripe, and all the bad seed picked out and burnt, and the rest kept away from the air in a cool, dry place. The risk of disappointment in some cases owing to a wet autumn is well worth taking.

6. Another point which amateurs would do well to remember is that mice are very fond of certain kinds of seeds —certain peas for instance. The seed should be slightly moistened, and mixed with a little red lead so that the seed is avoided by vermin. Birds, also, are very apt to peck and destroy seedlings. Where netting is not available, three or four strands of black cotton stretched over the rows on sticks will often serve to keep birds away.

Potato Clubs.

THE Agricultural Organisation Society is advising the starting of Potato Clubs in various parts of the country more or less on the lines of such a club originated some time ago by Lady Hylton in Somersetshire, and since adopted at Wivelsfield (Sussex). The plan of these clubs seems to be capable of easy adaptation to practically any district. Briefly, the method is as follows: The residents of a village or district form themselves into a club or society for the purpose of growing potatoes primarily for their own consumption. They hire a piece of ground from a farmer at a certain rent; the rent is not paid in cash, but is deferred until such time as the potato crop may be lifted and is then settled on an agreed basis. The same system is followed in relation to the ploughing of the land; this is done by a local farmer, or a man is employed; and the price of his work is booked against the forthcoming crop. Seed is obtained locally, as a rule, on similar terms. A price per hour is fixed for the labour of men, women, and children in the village or district, and an arrangement is made by which they shall work on the potato plot as opportunity occurs. No immediate payment is made for labour, but the time put in by each person is booked, and in due course this liability is also discharged in potatoes, not in cash. If there is a surplus of crop after the costs of rent, ploughing, seed, and labour have been dealt with, this surplus is sold and the proceeds divided proportionately among the various parties concerned.

Among neighbours, as a rule, there will be little fear of dishonesty; but if this seems possible it may be dealt with, so far as the labour question is concerned, by the appointment of a committee of three or four persons, and the provision of a time-book to be kept at a cottage near the potato plot. Intending workers will book in before commencing work and book out after finishing work. The members of the committee will be empowered to inspect the time-book at all reasonable hours, and to compare the entries with the labour in the field. Suitable penalties for sharp practices may be imposed if deemed necessary.

Open-Air Pig-Keeping in Kent.

FURTHER evidence of the success which may attend the open air system of pig-keeping is afforded by an instance in Kent, communicated to the Board by Mr. W. Cobbett Barker, of Bryant House, Rochester.

Mr. Barker owns some poor, hilly, grass land, studded with thorns and scrub, on to which he has turned his breeding sows. Shanties are put up at a selected spot for a few months only, and new ones are afterwards erected elsewhere on the land. The sows lead a very active life; they are out in the open all the year round, and "rough it" in every sense of the word, except that they are given peas and beans whenever available. While it must be admitted that Mr. Barker's boar is probably very sound, his sows have done remarkably well. Uniformly large litters of from 8 to 16 are obtained, and an average of from 10 to 11 pigs reared, twice a year.

The open-air method of pig-keeping must be one of the best ways of improving such poor land as that mentioned above, and at the same time increasing the head of pig stock in the country at a time when the cost of feeding stuffs is exercising an influence in the opposite direction.

*** Mr. S. F. Edge's system of keeping pigs on waste woodland was described in this *Journal* for January, 1916, p. 977. In the *Journal* for March, 1917, instances of successful open-air pig-keeping in Gloucestershire and Cornwall were given on pp. 1235 and 1236.

Pig-Feeding Schemes.

THE following Note has been communicated by the Agricultural Organisation Society:—

In connection with the Glamorgan Collieries, controlled by Lord Rhondda, a piggeries association on novel lines has been started. A number of the workmen having expressed a wish to begin pig-keeping, the Company agreed to erect 20 pigsties to be let to its employees for the purpose of pig-fattening on co-operative lines. Each member of the association must hold one £5 share, but must not hold more than one. Pigs and feed are to be bought collectively and the profits of the scheme divided equally amongst the members from time to time.

The Smallholders' Pig Association of Calne (Wilts) is an interesting enterprise that may appeal to the inhabitants of other villages. It aims to supply young pigs or feeding stuffs, or both, on credit or the instalment plan, and generally to help the would-be pig-keepers who are too poor to finance themselves.

At Devizes (Wilts) the Town Council has inaugurated a municipal pig-keeping scheme. A firm of local butchers have lent sties, a committee of local experts are superintending the experiment, and a local veterinary surgeon is giving his services free. The inhabitants generally for their part are keeping all waste vegetable matter and other possible pig food separate from the house rubbish, and it is being collected systematically.

Co-operative pig-keeping societies have been started at Chorley Wood, Amersham, and elsewhere on a simple and commendable plan. Well-to-do people with a little money to spare have been asked to put this down for the purpose of renting land, building sties, buying pigs and feeding-stuffs; people with no money to spare have been asked to give their labour in preparing the land, buildings, etc., and in attending to the stock. The co-operating workers are credited with 6*d.* per hour towards shares in the society, and eventually it is hoped that their holding will approximate to that of the financiers of the scheme. Any profits will be divided, and in several of the places where these co-operative pig societies have been started, should they prove successful, poultry, rabbits, etc., will also be handled.

Short Term Credit for Farmers.*

1. THE President of the Board of Agriculture and Fisheries has made arrangements with the leading banks for lending money to farmers for the purchase of seeds and manures for growing wheat, oats and potatoes.

2. Applications must be approved by the War Agricultural Executive Committee for the county in which the applicant's land is situated, and should be addressed to the Executive Officer of the county, whose address is given below. [An application form is printed on page 3 of the leaflet, and may be torn off and used for making an application.]

3. If the grant of credit is approved by the Committee, the applicant will be able to order the seeds or manures required, and the bill will be paid through a bank, on the applicant signing a promissory note, undertaking to repay the amount within nine months with interest at the rate of five per cent. per annum.

A list of the banks that have agreed to give credit under this scheme is printed on page 93.

* Reprint of Special Leaflet No. 72, copies of which may be obtained on application to the Board.

List of Executive Officers.

ENGLAND.

Beds	J. C. E. Robinson, Shire Hall, Bedford.
Berks	G. S. Bedford, Shire Hall, Reading.
Birmingham, City of ..	C. Napier Clavering, 3, New Street, Birmingham.
Bucks	Howard Jones, Denham, Bucks.
Cambs	W. R. Folgate, School of Agriculture, Cambridge.
Isle of Ely	(*Secretary*) E. E. Paynter, County Hall, March.
Cheshire	R. Douglas Wright, 49, Northgate Street, Chester.
Cornwall	F. R. Pascoe, County Hall, Truro.
Cumberland	G. W. Gilbanks, 5, Castlegate, Penrith.
Derby	J. R. Bond, County Education Office, St. Mary's Gate, Derby.
Devon	R. F. Woodcock, 50, Queen Street, Exeter.
Dorset	T. R. Ferris, County Offices, Dorchester.
Durham	F. P. Walker, Armstrong College, Newcastle-upon-Tyne.
Essex	R. Hunter Pringle, 49, Russell Square, London, W.C.
Gloucester	G. H. Hollingworth, Shire Hall, Gloucester.
Hants	E. H. Lunn, The Castle, Winchester.
Isle of Wight	A. E. Thurgood, 8, Southsea Terrace, Portsmouth.
Hereford	H. K. Foster, 3, Offa Street, Hereford.
Herts	G. J. Turner, Cole Green, Hertford.
Hunts	W. P. Theakston, Estate Office, Huntingdon.
Kent	(*Secretary*) G. H. Garrad, Sessions House, Maidstone.
Lancs	Dr. T. Milburn, County Offices, Preston.
Leicester	T. Hacking, 33, Bowling Green Street, Leicester.
Lincs :	
Parts of Holland ..	L. G. Harvey, Osborne House, Spalding.
,, *Kesteven* ..	F. Wakerley, 64, London Road, Grantham.
,, *Lindsey* ..	H. C. H. Tong, County Council Offices, Lincoln.
Middlesex	H. G. Crothall, Guildhall, Westminster, S.W.
Norfolk	H. Giles, 27, Prince of Wales Road, Norwich.
Northants	J. J. Green, County Hall, Northampton.
Soke of Peterborough ..	E. S. Tett, Estate Office, Wansford, Peterborough.
Northumberland	(*Secretary*) C. Williams, Moot Hall, Newcastle-on-Tyne.
Notts	W. R. Wintour, Shire Hall, Nottingham.
Oxford	W. Lester Smith, County Offices, Oxford.
Rutland	W. H. Hollis, 18, Catmos Street, Oakham.
Salop	(*Secretary*) F. Crowte, Shire Hall, Shrewsbury.
Somerset	(*Secretary*) N. Oldfield, 68, Boulevard, Weston-super-Mare.
Staffs	J. Hotchkiss, County Education Offices, Stafford.
Suffolk, East	A. W. Oldershaw, County Hall, Ipswich.
,, *West*	C. F. Pattle, Shire Hall, Bury St. Edmunds.
Surrey	H. E. Cooke, St. Ives, Penrhyn Road, Kingston-on-Thames.
Sussex, East	(*Secretary*) G. Montagu Harris, County Hall, Lewes.
Sussex, West	W. Lawson, County Hall, Chichester.
Warwick	B. Bull, Martin, Rugby.
Westmorland	J. W. Lowther, 15, Lowther Street, Kendal.
Wilts	A. Boa, County Offices, Trowbridge.
Worcester	S. Lander, 3, Sansome Place, Worcester.
Yorks—E. Riding ..	(*Secretary*) J. Bickersteth, County Hall, Beverley.
,, *N. Riding* ..	S. Dougill, County Hall, Northallerton.
,, *W. Riding* ..	(*Secretary*) W. Vibart Dixon, County Hall, Wakefield.

WALES.

Anglesey	Griffith Jones, Shire Hall, Llangefni.
Brecon	R. E. H. Williams, District Valuer's Office, Brecon.
Cardigan	John Jones, Cwmere, Felinfach.
Carmathen	D. Johns, Education Offices, Carmarthen.
Carnarvon	Evan R. Davies, Education Offices, Carnarvon.
Denbigh	Gomer Roberts, Llanfair Villas, Llanfair, near Ruthin.
Flint	J. P. Griffiths, Preswylfa, Penyffordd, Chester.
Glamorgan	T. F. Pritchard, 13, St Andrew's Crescent, Cardiff.
Merioneth	R.R. Jones, Cefntrefor Fawr, Talsarnav, Merioneth.
Monmouth	W. J. Grant, County Council Buildings, Newport, Mon.
Montgomery	J. L. John, Agricultural Offices, Welshpool.
Pembroke	(*Secretary*) H. E. H. James, 8, Victoria Place, Haverfordwest.
Radnor	D. Thomas, Llwynon, Builth Wells.

List of Banks that have agreed to provide Special Credit Facilities for Farmers.

Barclays Bank, Limited.
Beckett's Bank, Leeds.
The Capital and Counties Bank, Limited.
The County and Westminster Bank, Limited.
Fox, Fowler and Company's Bank, Wellington, Somerset.
The Bank of Liverpool, Limited.
Lloyds Bank, Limited.
The London City and Midland Bank, Limited.
The London Joint Stock Bank, Limited.
The London and Provincial Bank, Limited.
The London and South Western Bank, Limited.
The Manchester and Liverpool District Banking Company, Limited.
Martin's Bank, Limited.
The National Bank, Limited.
The National Provincial Bank of England, Limited.
The Nottingham and Nottinghamshire Banking Company, Limited.
Parr's Bank, Limited.
The Union of London and Smiths Bank, Limited.
The Union Bank of Manchester, Limited.
Williams Deacon's Bank, Limited.

The Future Position of Horse Breeding.

AT the War Office on 20th February, 1917, the Earl of Derby, K.G., Secretary of State for War, and the Right Hon. R. E. Prothero, M.V.O., President of the Board of Agriculture, received a deputation from members of the Hunters' Improvement and National Light Horse Breeding Society.

The Hon. Alexander Parker, in referring to the very grave alarm with which the Society viewed the future prospects of the breeders of light horses and of the horse supply of the country remarked that the Society, while encouraging the breeding of the highest class of hunter, had always felt that by so doing it was indirectly assisting to produce a large number of horses necessary for the Army. It was undoubtedly in the hope of obtaining the high prices that good hunters commanded, that the majority of breeders of light horses were induced

to continue breeding. The Society, however, had long felt that the industry required considerable Government help to raise the standard of the horses that were being bred, so that there might be a sounder and more useful class of horse in the country in case of emergency. The Society fully realised that the supply of horses of the artillery type was dangerously deficient, and it was anxious and ready to co-operate in any scheme whereby this state of affairs might be rectified.

In June, 1910, the Horse Supply Committee under Lord Faversham's chairmanship issued an important Report containing numerous suggestions, and Mr. Parker pointed out that these recommendations were adopted, almost in their entirety, by the Board of Agriculture and Fisheries; and the Society considered that, in view of the limited amount of money at their disposal, the Board had done a vast amount towards putting new life into an industry which was rapidly crumbling away.

In August, 1915, Lord Selborne, the then President of the Board of Agriculture and Fisheries, in consequence of the very urgent representations of the War Office as to the serious position of the horse supply of the country, appointed a Committee under Lord Middleton's chairmanship "to consider and advise the Board of Agriculture and Fisheries as to what steps should be taken to secure the production and maintenance in England and Wales of a supply of horses suitable and sufficient for military purposes, especially on mobilisation." The Society respectfully begged perusal of the Report, which clearly set forth the position of horse breeding in this country, and at the same time offered some valuable suggestions whereby the industry might be put on a sound footing. The conclusions arrived at by the Committee were summarised at the end of the Report under fourteen heads, nine of which applied to the Board of Agriculture and five to the War Office.

The Society cordially approved of these conclusions and recommendations, but much regretted that all the labour of the Committee, which was considerable, appeared to have been in vain, inasmuch as in no single instance had its recommendations been followed with the exception that the Board were seriously considering the compulsory annual registration of stallions.

The Society felt that were the Government to guarantee adequate annual funds, so that an advance might be made on the lines suggested in the Report, light horse breeding might be put on a highly satisfactory and sound basis. The crux of the matter was that the breeder had no remunerative market to look forward to. Before the War he could rely on a market, circumscribed though it might be. There was the Hunter market and the Foreign market; these were the only two that it paid to breed for. Both these were gone. All he could now hope for was the totally inadequate price that he may expect from the War Office, added to which he had no one to break his young horses and the cost of fodder was prohibitive. Fewer mares were sent to the horse last year compared with 1915, and it was the Society's firm conviction that fewer still will be sent this year. The position was indeed deplorable.

It appeared to the Society, therefore, that unless something was done, and done quickly, to guarantee to the breeder a fair market for his stock, not only would the breeding of light horses decline to a minimum but that the interest which had been kindled in the industry with considerable success by the Board during the last six years would dwindle away, and that it would take a generation and a very heavy

expenditure to resuscitate it. To create this market they realised that money must be forthcoming from the Treasury not only to enable the Remount Department to pay more for their horses, but also to enable them to buy unbroken horses at three years old, and so relieve the breeder of stock, the keeping of which he now finds to be a burden and one which is very general throughout the country. In order, however, to get the best possible results from the money spent on horse breeding the Society considered, that, as recommended in paragraph 77 of the Report of Lord Middleton's Committee, an expert and adequate staff is essential, inasmuch as the success of any National Horse-Breeding scheme must depend on proper supervision and continuity of policy.

In conclusion Mr. Parker said that the object of the deputation was, if possible, to obtain some definite statement as to what breeders may look forward to from the Government, so that they may clearly understand their position and formulate their plans for the future accordingly, as on this depends the question as to whether the country will be in a position to produce and maintain a supply of horses suitable and sufficient for military purposes. We have been able during this War to import vast numbers of horses from overseas, but it would be madness to rely on being able to accomplish this with such comparative ease again.

The Council of the Hunters' Improvement and National Light Horse Breeding Society, having duly considered the matter, were of opinion that they would be failing in their duty did they not bring to notice the serious position of the horse supply of the country.

Sir Gilbert Greenall, speaking on behalf of the Royal Agricultural Society, remarked that he was quite sure the Council would endorse everything that Mr. Parker had said; they felt that there were lots of difficulties with which to contend, but one thing they were very certain of, and that was that if anything was to be done it should be done at once before the season starts.

Mr. Prothero, who first replied to the deputation, stated that the Board of Agriculture appreciated very warmly the valuable assistance they had had from the Hunters' Improvement Society, not only in preparing their scheme originally, but in giving effect to it. He noticed that all the speakers were members of the Advisory Committee of the Board of Agriculture.

The Board's scheme had been a very considerable success in the past. Since its inception the number of thoroughbred stallions had been increased, and they were much better than they used to be, and he thought that a very strong point. Then, also, the voluntray scheme for the registration of stallions had been very successful, remarkably so. It showed that the Board's registration had a commercial value, and this was a matter which promised well for the future.

The aim of the Board now, as it always had been, was to grade up and improve the horses bred, and they thought that improvement in quality was really more important than increase in quantity; and although the misfit always must come every now and then, it was more than ever necessary that breeders should take the greatest care in the selection of the mares, in the choice of the stallions, and the care of the young stock. In all those points Mr. Prothero was sure he might rely on the Society to do their utmost with the farmers in their different localities.

He agreed with Mr. Parker that the crux of the whole situation was having a remunerative market. There was no doubt that that was so.

If breeders saw their way to produce horses at a reasonable profit, there would be plenty of horses bred, but in order to do this they must aim at really very high-class horses. Horses of that class will, he hoped, before long be wanted again for hunting, which, after all, was the backbone of the light-horse breeding industry. Without it we could not hope to revive the industry. But he did hope that the War Office would be able to give some assurance that the Army will become a larger and more remunerative market than heretofore, and that the farmer will be in that way encouraged to produce horses which, if they miss the hunter market, can yet be sold at a profit for Army purposes.

So far as the Board was concerned, they proposed to carry out the first conclusion of Lord Middleton's Committee's Report, to protect the farmer from unsound stallions by compulsory annual registration of all stallions that are travelled for a service fee or publicly exhibited for stud purposes. In the next place, they proposed to arrange for the inspection by the Board's officers of stallions recommended for Board's Premiums. The Board would also be prepared, if and when they got Treasury sanction, to purchase a few stallions every year, not of course in substitution of those provided by private enterprise, which they should not wish for a moment to attempt, but to supplement those which are so provided.

The Board did not contemplate taking any action at the moment in regard to brood mare schemes, or the award of prizes for mares and foals. But it was quite obvious that if they were going to buy stallions, if they were going to run stallions of their own as well as to subsidise stallions, they must have an additional expert staff, and they must reconstitute the Board's Advisory and County Committees if any comprehensive national breeding scheme is to be adopted, and again, subject to Treasury sanction (which is not always easy to obtain), it was proposed to make that part of the policy of the Board.

Lord Derby, who followed Mr. Prothero, thanked the Hunters' Improvement Society for the assistance given to the War Office by their members, and said that as regards the riding horses, as long as racing, hunting, and polo continue, speaking for himself, and he thought he could speak for the Army also, he should view with the gravest concern anything which threatened permanently to interfere with any one of these sports. As far as he was concerned he should always support all three.

As to the classes of Army horses—light draft, riding horses, and heavy draft—it was difficult to say what were likely to be the requirements of the Army, but, of the animals now serving with the Army in France, 54 per cent. were light draft, 30 per cent. were riding horses, and 16 per cent. were heavy draft. Of the total riding horses one quarter only belonged to Cavalry Divisions, and of the whole number of horses of all kinds, only 10 per cent. belonged to Cavalry Divisions. This gave some idea of the proportion of horses required for the Army at war strength, and led to another important factor, viz., that the peace strength was but a small proportion of the war strength.

In our own scheme of government, as well as among the great military nations of the Continent, the duty of maintaining the horse stock of the country at a suitable level was always assigned to a civil department. It was not for the War Office to venture to interfere in the business of the Agricultural Department, but merely to say what

it wanted and to give all the help it could on the lines agreed between the two Departments. He was sure that Mr. Prothero could rely on the active co-operation of the War Office.

Though he would not be in office when peace methods were decided, and therefore could not pledge his successor, he was now prepared to recommend to his successor the adoption of the Selborne Committee's suggestions as to the future action of the War Office as regards their method of buying horses. A larger portion of the annual purchase would, he trusted, be made in Great Britain, and, after the War, he hoped that the War Office would buy what it could from breeders direct at 3½ years old at a fair price.

Horse breeding should be reasonably profitable with a mare that could earn her living on the farm, if premium or State-owned stallions were provided at nominal fees, and possibly a market for the produce at 3½ years old. As regards the market, it was quite impossible to make any forecast of what the future strength of the Army might be, but he was probably within the mark if he said that the number of horses bought annually for the Army after the War would not be less than those that were bought before the War. The War Office would certainly (speaking with regard to the Territorials) see whether they could not do something in the way of boarding out in order to help both their training and the horse-breeding industry.

It would never pay to breed inferior stock, whether for racing, for light draft horses, or for heavy draft horses—it was only the best that would ever pay, and it was only the best that could ever be encouraged.

OFFICIAL NOTICES AND CIRCULARS.

LABOUR—HORTICULTURE—PRICES—PASTURE LAND—HOPS—MISCELLANEOUS.

LABOUR.

The following Circular Letter, dated 2nd March, was issued by the Food Production Department of the Board, to War Agricultural Committees in England and Wales.

Soldiers for Agricultural Work.

SIR,—1. The War Office is prepared to provide a certain number of men to assist in agricultural operations in England and Wales. Some of these men will be provided from the Home Defence Force and others from the Army Class W Reserve.

2. *Home Defence Force Men.*—These men, 12,500 in number, are intended for the work of spring cultivation and will be subject to recall on 15th April. Whilst the War Office cannot guarantee that all these men will possess a knowledge of agriculture they have undertaken to select, as far as possible, fit and able-bodied men with such knowledge. The demand for these men should be ascertained by the War Agricultural Committee of each county, and the Board notified of the number likely to be required. Certain military depots have been selected to be used as distributing centres, and the War Office will move men to these depots to meet the demand for such labour as soon as the numbers needed are made known to them by the Board. As stated in the Board's telegram of to-day's date you should telegraph to the Board immediately the number of such men you can place with farmers forthwith.

3. *Army Class W Reserve.*—In view of the difficulties experienced in satisfactorily utilising the services of combatant prisoners of war under the conditions laid down by the War Office, an arrangement has been come to by which 4,000 able-bodied soldiers belonging to Infantry Works Battalions will be transferred to the Class W Reserve, and placed at the disposal of the Board in lieu of the 4,000 combatant prisoners of war that were allocated for agriculture in January last. These soldiers will, subject to unexpected military exigencies, remain in agriculture till the end of the War. It is hoped that in cases where the schemes prepared under the conditions described in the Board's Circular (A 287/C), dated the 16th January, relating to the employment of prisoners of war have reached an advanced stage, it may be possible to send non-combatant prisoners, but a further letter will be addressed to you on this subject in a few days. In the meantime no further steps should be taken by your Committee in connection with schemes for the employment of such prisoners.

4. In addition to these 4,000 soldiers, at least another 6,000 men of lower medical categories, making for the present 10,000 in all, will be provided from classes of enlisted men not reserved for Home Defence, and will also be available for farm labour until the end of the War, unless they are recalled for urgent military reasons. These men, until allotted to individual farmers, will be stationed at the military depots referred to above.

5. Any farmer who wishes to employ men belonging to either of those two classes, namely, the Home Defence Force men temporarily available and Class W Reserve men probably available until the end of the War, should make an application to the County War Agricultural Committee, and will be required to fill in a form of application stating that he agrees to the terms under which the soldier is being lent to him. Special forms are being printed for this purpose.

6. When the farmer boards and lodges the men, he will pay the rate of wage current for agricultural labourers who live in, otherwise, he will be required to pay the rate current for agricultural labourers who live out. When the Officer Commanding Agricultural Company desires information as to what the current rate is or what are fair wages for overtime work, or piece work, whether for men living in or out, he will refer to the War Agricultural Committee, whose decision will be final. No payments will be made by the farmer to the soldiers, but all amounts will be paid weekly to the Officer Commanding Agricultural Company. The hours of work will be those customary in the district.

7. The farmer will not have to pay railway fares, but will be required to make arrangements, at his own expense, for the conveyance of the men between the railway station and the farm, to provide all necessary tools and appliances, and to insure the men under the Workmen's Compensation Act, but he will pay no contribution for Health Insurance. *He may dismiss a man on giving one day's notice, or one day's wages in lieu thereof.* The man will thereupon return at once to his unit. On the termination of the engagement, the farmer will complete a form to be brought by the soldier, and return it by post to the Officer Commanding the unit to which the soldier belongs, stating the reason for which the engagement has been terminated.

8. It is suggested that your Committee should take steps to make this scheme (which supersedes that described in Army Council

Instruction 1056 of May, 1916) known without delay to the farmers in the county, whether by notices in the Press or by sending out posters. *It is important to emphasise the need for making instant application for the services of men of the Home Defence Force who will be available only until the middle of April*, and even in the case of the Class W men, applications should be made as soon as possible. It will be open to your Executive Committee to apply for any of these soldiers in connection with the cultivation of land on which the Committee enters.

9. The maximum number of men of each class that it is hoped will be available for your county is stated in the covering letter, which also contains the address of the Army depot to which your Committee should forward applications for the men required in your county. Your Committee should also keep the Board informed at least once a week of the number of soldiers who have been applied for so that the Board may advise the War Office of the demand for men likely to be made on each of the depots.

10. As these applications are likely to be numerous and urgent I suggest that the War Agricultural Committee should appoint a sub-committee to deal with them, if necessary co-opting one or two persons who can give their whole time to the work for the next fortnight or longer. The Sub-Committee might have a special secretary of its own, and farmers and Employment Exchanges should be asked to submit all applications to the Secretary of the Sub-Committee direct at a separate address in order to prevent the ordinary work of the Executive Committee being delayed. Voluntary assistance might be sought in connection with the clerical work involved.

11. The Board of Agriculture recognise that in connection with this scheme there are two inherent difficulties which must be faced. Firstly, a proportion of the men will be untrained in agriculture; secondly, some of the men may find the conditions of country life unattractive. It is important that your Committee should take all possible measures to encourage farmers to teach any untrained men their work, and to make the best of this labour now available. *They should also be urged to make the men as comfortable as possible.*

I am, etc.,

ARTHUR LEE, *Director-General.*

THE following Notice, dated 20th March, 1917, has been issued by the Food Production Department of the Board :—

Notice to Farmers: Military Service.

To whom the Military Service Acts apply.—1. The First Military Service Act of 1916, known as "the Principal Act" applied to single men. The Military Service Act, 1916 (Session 2), known as "the Amending Act," extends compulsory military service to all male British subjects ordinarily resident in Great Britain who have attained, or hereafter attain, the age of 18 years, and who had not attained the age of 41 years before the 24th of June, 1916, subject to certain exceptions amongst which are members of His Majesty's Regular or Reserve Forces, which exception includes men who are voluntarily attested under the Group System (commonly known as Lord Derby's Scheme) in Section B, Army Reserve.

2. Men who came within the provisions of the Principal Act, *i.e.*, men not voluntarily attested who, on the 2nd of November, 1915, were single or were widowers without children dependent on them,

and who had attained the age of 18 years on the 15th of August, 1915, and had not attained the age of 41 years before the 2nd of March, 1916, should have made application for exemption before the 2nd of March, 1916.

3. A man who has been discharged from naval or military service on the termination of his period of service is not excepted on this ground.

4. Every man to whom the new Act applies and who came within its terms on the date of the passing of the Act, viz., the 25th May, 1916, was, as from the "appointed date," the 24th of June, 1916, deemed to have been enlisted and to have been passed to the Reserve, unless he had been exempted from the provisions of the Act. If exemption was desired he should have applied to the Local Tribunal for a Certificate before the 24th June, 1916.

Persons who have attained the age of 18 years after the 25th May, 1916, or hereafter attain that age came or will come within the operations of the Act on the thirtieth day after the date on which they attained or attain the age of 18. (See paragraph 10 as to applications for exemption.)

Men Engaged in Certified Occupations.—5. The Board of Agriculture and Fisheries have certified, after consultation with the Army Council, that the work of men in the following list of agricultural occupations is work of national importance, and that *subject to the provisions as to individual certificates contained in the Regulations and Instructions*, the classes or bodies of men who are employed in these occupations, and who fulfil the conditions specified as to age, marital condition, and date of entering their present occupation, are exempted from the provisions of the Military Service Acts, 1916, or, *if they are voluntarily attested men*, from being called up for military service.

List of Agricultural Certified Occupations (England).—6. Farmer (including Market Gardener and Fruit Farmer)—Provided that—

(*a*) farming is his sole occupation and his personal labour or superintendence is indispensable for the proper cultivation of his holding; or

(*b*) if he is partly occupied in another occupation, his personal labour or superintendence is indispensable for the proper cultivation of his holding and such cultivation is expedient in the national interest.

Agricultural Machinery, Steam Ploughs and Threshing Machines:—Attendant; Driver; Mechanic.

Farm—Bailiff, Foreman, Grieve, Steward (*unmarried men up to the age of* 30 *not covered by List*).

„ Beastman, Byreman, Cattleman, Stockman, Yardman;
„ Carter, Horseman, Ploughman, Teamster, Wagoner;
„ Hind (if Foreman or Ploughman);

(*Unmarried men up to the age of* 25 *not covered by List.*)

Shepherd.

Thatcher.

Stallion Man (a man who looks after and travels a stallion).

Hop, Fruit and Market Gardens:—Foreman. (*Unmarried men up to the age of* 30 *and married men up to the age of* 25 *not covered by List.*)

Seed Growing Industry* :—

Head of Department; Seed Expert. (*Unmarried men up to the age of* 30 *and married men up to the age of* 25 *not covered by List.*)

Forest-tree Nurseries :—

Seed Expert. (*Unmarried men up to the age of* 41 *and married men up to the age of* 31 *not covered by List.*)

NOTES.—Age means the age of the man on the 1*st May*, 1916.

A man under the age limits stated in the List, if found on examination by a Recruiting Medical Board, before his case has been decided by a Tribunal, not to be fit for General Service (Category A) or for Garrison Duty Abroad (Category B 1) is entitled to be treated as engaged in a certified occupation.

The only persons covered by the List of Certified Occupations are those whose principal and usual occupation is one of those included in the above List. By the use of the term "principal and usual occupation" it is intended to exclude from exemption those persons who may be only occasionally employed in work of a kind similar to that of one of the occupations, but who do not follow it in any regular fashion and are not really engaged in the occupation in the proper sense of the word.

Unmarried men in any of the occupations included in the List are covered only if they can show that they were engaged in the same occupation *on or before the date when the National Register was made, namely, the* 15*th August*, 1915.

Men who on the 2nd November, 1915, were unmarried or were widowers without any child dependent on them are to be treated as unmarried men for the purpose of the List.

How to Obtain and Send in Forms of Application for Exemption.—7. Applications for exemption must be made *in duplicate* on the prescribed form which may be obtained from the Clerk of the Local Tribunal, and which it is his duty to be prepared to supply. Applications for forms, and forms of application when filled up, must be addressed to the Office of the Clerk to the Local Tribunal, and may be delivered at or sent by post to that Office.

Grounds of Application for Exemption.—8. As regards men covered by the List of Certified Occupations, claims for exemption may be made on the ground that the man is engaged in an occupation certified by a Government Department and appearing on the official list of such occupations for the time being in force (*see* paragraph 5 and 6).

As regards men not covered by the List of Certified Occupations, *including men who are indispensable for the cultivation of the farm or the maintenance of the head of live stock upon it*, applications for exemption may be made

(*a*) on the ground that it is expedient in the national interests that the man should, instead of being employed in military service, be engaged in other work in which he is habitually engaged;

(*b*) on the ground that it is expedient in the national interests that the man should, instead of being employed in military service, be engaged in other work in which he wishes to be engaged;

* In view of the importance of maintaining a supply of agricultural seeds, the Reserved Occupations Committee considers that farmers growing agricultural seeds in bulk for seedsmen should receive special consideration from the Tribunals with regard to the trained men required for the purpose.

(*c*) if the man is being educated or trained for any work, on the ground that it is expedient in the national interests that, instead of being employed in military service, he should continue to be so educated or trained ;

(*d*) on the ground that serious hardship would ensue if the man were called up for Army service, owing to his exceptional financial or business obligations or domestic position ·

and, if the man comes within the provisions of the Military Service Acts, 1916 ;

(*e*) on the ground of ill-health or infirmity ;

(*f*) on the ground of a conscientious objection to the undertaking of combatant service ;

and the Local Tribunal, if they consider the grounds of the application established, shall issue a certificate to the man in respect of whom the application is made.

Note.—Men covered by the List of Certified Occupations may also apply on the grounds (*d*), (*e*) and (*f*) above, although it may not ordinarily be necessary for them to do so.

Period within which Application must be made by any Voluntarily Attested Men Covered by the List of Certified Occupations.—9. An application must be delivered to the Local Tribunal in the prescribed form in duplicate not later than seven days after individual notice has been sent to the man by the Military Authorities calling him up from the Reserve for service with the Colours.

Men of 18.—10. With reference to the Proclamation dated the 30th January, 1917, calling up men of 18 for service with the Colours, the position with regard to applications to the Tribunals for Certificates of Exemption in respect of such men is as follows :—

In the case of men to whom the Military Service Acts apply :—

(*a*) Applications should be made before the 30th day after the date on which the man attained the age of 18 years.

(*b*) Applications may be entertained by the Local Tribunal if made after that date, *if good reason is shown.**

In the case of Voluntarily Attested men :—

(i.) If *not covered by the List of Certified Occupations*, application should have been made in the case of men in Group A (*i.e.*, men born in 1898) not later than 10 days after the issue of the Public Notice calling up the Group in which the man is placed, *i.e.*, 9th February, 1917, and in the case of men in Group B (*i.e.*, men born in 1899) application should be made not later than a date 10 days after the day on which they attain the age of 18.

(ii.) Application in respect of a man *not covered by the List of Certified Occupations*, may be entertained by the Local Tribunal after the dates mentioned in sub-paragraph (i.) above *if good reason is shown*,* but in any case not later

*It must be shown to the satisfaction of the Tribunal that the failure to make the application within the proper time has arisen owing to the absence of the applicant abroad, or owing to any other cause which appears to the Tribunal to afford a reasonable ground for allowing the application to be so made.

than 7 days after individual notice has been sent to the man by the Military Authorities calling him up for service with the Colours.

(iii.) If *covered by the List of Certified Occupations*, application may be made not later than 7 days after individual notice has been sent to the man by the Military Authorities calling him up for service with the Colours.

Appeals from Decisions of Tribunals must be made within Three Days.—11. Appeal Tribunals have been established to which an appeal may be made by any person aggrieved by the decision of the Local Tribunal, or by the Military Authorities, including a decision of a Local Tribunal not to allow an application for the granting of a certificate of exemption to be made out of date. The Appeal must be made *not later than three clear days after the date of the written decision of the Local Tribunal*, and proper forms for the purpose may be obtained from the Clerk to the Local Tribunal. Further appeal may be made by leave of the Appeal Tribunal from that Tribunal to the Central Tribunal, but it is not intended that cases shall come before the Central Tribunal unless important questions of principle are involved, or unless there is some other special reason why an appeal should be allowed. Notice of appeal must be given not later than three clear days after the date of the written decision of the Appeal Tribunal. As an alternative procedure, any party present when the decision of the Appeal Tribunal is given may apply forthwith for leave to appeal to the Central Tribunal.

How to Apply for a Renewal of a Certificate of Exemption.—12. If the Certificate has been granted in pursuance of the decision of an Appeal Tribunal varying the decision of the Local Tribunal any application for the renewal of the Certificate must be made to the appropriate Appeal Tribunal.

In all other cases applications for renewal must be made to the Local Tribunal.

Forms for the purpose may be obtained from the Secretary of the Appeal Tribunal or the Clerk to the Local Tribunal.

A certificate of exemption may, however, be granted by a Local Tribunal or by an Appeal Tribunal, subject to the condition that it shall not be renewable except on an application made with the leave of the Tribunal on whose decision the Certificate was granted. In such a case an application for renewal will not be entertained unless leave to apply has been given by the Tribunal which imposed the condition. There is no appeal to a higher Tribunal against the decision of a Tribunal to refuse leave to apply for a renewal of a certificate.

Period within which Application for a Renewal of a Certificate of Exemption is to be made.—13. In the case of a man to whom the Military Service Acts apply and whose certificate ceases to be in force after the 15th March, 1917, any application for renewal may be made before, or within *two weeks* after, the date on which the certificate ceases to be in force.

In the case of voluntarily attested men any application for renewal must be made before the date on which the certificate ceases to be in force or not later than seven days after individual notice has been sent to the man by the Military Authorities calling him up from the Reserve for service with the Colours.

Applicants for Exemption not to be Called Up for Military Service while their Applications are still under consideration.—14. *Where an application has been made* to a Tribunal or *where Notice of Appeal to the Appeal Tribunal has been given* in the proper form and within the prescribed time, the man in respect of whom such application or notice of appeal has been made is not liable to be called up for service with the Colours until his case has been finally disposed of. If through inadvertence a Notice calling up the man for service with the Colours is sent to him while his case is under consideration, he should at once communicate with the Recruiting Officer and inform him of the facts of the case in order that the Notice may be cancelled.

Powers of the Army Council and Military Representative in regard to Applications by Men for Certificates of Exemption and to Withdrawals or Variations of Certificates when granted.—15. Where a man either holds a certificate of exemption on the ground that he is engaged in a "certified occupation," or in the case of a voluntarily attested man, his name is marked in the Military Classification Register as not to be called up for service with the Colours on the ground that he is engaged in a "certified occupation," the Military Representative may apply to the Local Tribunal for a decision that the man should be rendered available to be called up for service with the Colours upon the following grounds, or either of them :—

(1) that the man's principal and usual occupation is not, in fact, one of the "certified occupations"; or

(2) that, notwithstanding that the man's principal and usual occupation is one of the "certified occupations," it is no longer necessary in the national interests that he should continue in civil employment.

The Military Representative may object on the same grounds to a certificate of exemption being granted.

The Military Representative may also apply at any time to the Local Tribunal for the withdrawal or variation of a certificate of exemption granted to a man on grounds other than that he was engaged in a certified occupation.

The Army Council may also, by the issue of an Army Council Instruction, authorise the general review of all certificates of exemption granted to men or classes of men specified in the Instruction, and the Tribunal will thereupon review the certificates subject to the following provisions :—

(*a*) a date shall be fixed for the hearing of each case ;

(*b*) at least three clear days before the hearing the Tribunal shall send to the holder of the certificate and to the Military Representative notice in writing of the date and place fixed for the hearing.

Release of Individual Soldiers for Agriculture.

THE following Circular Letter, dated 28th March, 1917, has been addressed by the Director-General of Food Production to the Secretaries of County War Agricultural Executive Committees in England and Wales :—

SIR,—(1) It is considered desirable that the position with regard to the release of individual soldiers for the purpose of returning to their civil employment should be clearly explained.

(2) Although the War Office adhere to their opinion that the most desirable method of reinforcing labour on farms is by means of a system of sending detachments of soldiers to selected localities, yet the War Office are prepared to consider applications for the release of individual men to return to particular farms, provided the circumstances are really exceptional.

(3) The following are illustrations of what may be described as exceptional circumstances :—

(*a*) Where the soldier is the farmer himself and is required to manage the farm ;

(*b*) where a son, owing to his father's recent decease, has become the virtual tenant and is required to manage the farm ; or

(*c*) where the wife and family of the soldier are living in one of the farmer's cottages, and the soldier is in a low medical category.

As regards men serving overseas, an even greater degree of urgency is required to be shown before there is any likelihood of their release being favourably considered.

(4) In dealing with future applications for the release of individual men, it is proposed to refer the cases in your County to your Committee for their opinion, and reliance is placed upon your Committee not to recommend any case unless they are clearly satisfied that it is impossible for the farm to be properly cultivated (*e.g.*, by the use of soldier or other labour), unless the particular man is returned to his civil employment.

I am, etc.,
ARTHUR LEE,
Director-General of Food Production.

10,000 Farm Women Needed.

THE need of women for the land is very urgent in view of the fact that in the middle of April soldiers who are helping the farmers will be recalled. The actual workers required at once are 5,000 milkers,* 4,000 field workers, and 1,000 carters.

The women will receive a free outfit—high boots, breeches, overall, and hat—from the Government, and also maintenance during training, travelling expenses, promotion with higher pay for good work, and a minimum to start with of 18*s.*, or the district rate, whichever is the higher.

Forms of enrolment are to be had at every post office and all employment exchanges.

Pooling of Labour on Small Holdings.

OWING to the demands of the Army for men, it is possible that some small holdings and allotments which, in normal times, are intensively cultivated, may be in danger of not being worked to their full capacity. It is very undesirable that the supply of home-grown food should be diminished owing to this cause, and where there are groups of small holdings or allotments every endeavour should be made to induce co-operative working, so as to ensure that they are fully cropped.

* The requirements have been increased to 10,000 milkers since this Notice was first issued.

HORTICULTURE.

THE following Circular Letter, dated 9th March, was issued by the Food Production Department of the Board to Agricultural and Horticultural Colleges :—

Help of Colleges in Food Production.

SIR,—The present time offers a favourable opportunity for initiative on the part of Agricultural and Horticultural Colleges in encouraging within their several areas increased food production in allotments, small gardens, etc. The means to be taken by a college must depend on the kind of district in which it is situated, and in no case should energy now devoted to food production on an agricultural scale be diverted to this subsidiary albeit important subject. Nevertheless, wherever possible the college should be or become a centre for help and instruction in vegetable gardening. Where no horticultural department exists or limitation of staff prevents the agriculturists on the staff from taking an active part in this work, the college may nevertheless assist by establishing a Food Production Committee of competent professional and amateur gardeners, either independently or in association with the local authority, Women's War Agricultural County Committees or other local organisations already at work. The object of the Committee should be to encourage and assist the small cultivators in the district, and to ensure that new ground being prepared for vegetable crops shall be thoroughly well cultivated. (See letter to Town and Urban District Councils printed below.) The Committee might report in due course the results of its work to the Director-General of Food Production, who will be prepared to give the Committee any assistance it may require, for example, in providing expert advice and in supplying pamphlets on the different aspects of vegetable production.

I am, etc.,

ARTHUR LEE, *Director-General of Food Production.*

THE following Circular Letter, dated 9th March, was issued by the Food Production Department of the Board to the London County Council and the Councils of Boroughs and Urban Districts in England and Wales.

Local Authorities and the Cultivation of Gardens.

SIR,—In the Circular Letter issued by Lord Rhondda and Mr. Prothero on the 31st January last it was suggested that local authorities should immediately take all necessary steps to secure a full cultivation of available land within their districts, and should appoint working committees to give full effect to the Orders of the Board of Agriculture enabling Councils to secure land for cultivation.

Those Orders expressly except from compulsory acquisition gardens or pleasure grounds occupied or usually occupied with a dwelling house. It is considered that it would not be fair or reasonable to take over such land without the consent of the owner, but if such consent can be obtained, I am to suggest that Local Food Production Committees could do most useful work by organising arrangements for the cultivation of gardens attached to empty houses.

It is suggested that this work might be organised on the following lines. A Food Production Committee, consisting of members of the council and other local residents, might be appointed if this has not

already been done. This Committee should then arrange for a public meeting to draw attention to the need for this work, to invite voluntary workers, including those who can give part of their time at regular stated periods, and to enlist the assistance of professional gardeners in the neighbourhood. Volunteers should be sought from all classes, and in particular the assistance of women should be invited. If a Women's War Agricultural Committee is in existence in the district, their co-operation should be enlisted.

Lists of suitable vacant gardens should be prepared and the permission of the owners obtained to allow their cultivation as a purely temporary war measure. It should be made clear to the owners that they are only asked to allow the use of the land for cropping this year, and that possession will be surrendered at once without making any claim for compensation if the house should be let. When the owner's permission has been obtained, arrangements should be made either to allot separate plots to individuals who have volunteered to work or to organise the cultivation of the whole garden on co-operative lines. In either case provision should be made so that the cultivators may obtain expert advice from professional gardeners or other competent persons.

Each district will be able to organise a scheme of this kind on the lines most suited to their own locality, but I desire to commend the matter to your special consideration. In the urgent need for increased food production no means to that end should be neglected, and it will often be the case that any spare-time labour available can be employed to greater advantage in cultivating garden ground which has until recently been under cultivation than in breaking up vacant building sites.

I am, etc.,
ARTHUR LEE, *Director-General of Food Production.*

THE following Notice was issued by the Food Production Department of the Board on 15th March :—

Help from Glasshouse Owners in the Supply of Spring Cabbages.

The recent severe weather has caused the destruction of a great quantity of spring cabbages in certain parts of the country. In order to remedy the loss in some measure, owners of glasshouses and frames may be of great assistance. But in order to help to provide a supply of plants which should come in during late summer they must sow as soon as possible. Since there is no time to write in order to inquire as to local needs, gardeners are asked to sow what they can and then to find out how many seedlings are likely to be required locally. They will thus know how many to prick out.

The following methods are suggested : method 1 being the more speedy, but requiring greater care and labour.

Method 1.—Sow at once an early maturing cabbage in boxes or pans in moderate heat, keeping close to glass all through. Prick out as soon as large enough and keep in heat until well established. Then gradually harden off in cold frames and finally in the open air. Transplant as soon as ready in good, firm soil.

Method 2.—Sow at once *thinly* in a seed bed made not more than a foot from the glass in a cold frame. Harden off by

removing lights on all favourable occasions as soon as the plants are about four or five inches high. Draw straight from the bed to transplant.

The following varieties of summer cabbages, in order, were the quickest to mature in a recent comparative trial at the Royal Horticultural Society's Garden at Wisley :—

"Best of All,"	sent by	Messrs.	Barr & Sons.
"Harbinger"	,,	,,	Nutting.
"Express"	,,	,,	,,
"Earliest"	,,	,,	Sutton & Sons.
"First Crop"	,,	,,	Johnson.
"First"	,,	,,	Cooper, Taber & Co.

Appointment of Horticultural Representatives.

THE following Circular Letter, dated 26th March, 1917, dealing with the appointment of horticultural representatives, has been addressed by the Food Production Department of the Board to the Women's War Agricultural Committees and other organisations which are occupying themselves with the horticultural side of Food Production. Copies have also been sent to the County War Agricultural Committees and to the Executive Committees :—

SIR, or MADAM,—At the request of the President of the Board of Agriculture and Fisheries, I have undertaken the duty of endeavouring to organise the increased production of vegetables, etc., in allotments and cottage gardens, and, with this object, a special Horticultural Section of the Food Production Department of the Board has been established.

I am anxious to obtain the assistance of men and women interested in horticulture, and in rural life generally, who will act as Horticultural Representatives of the Department in rural and urban districts. The principal duty of these representatives would be to encourage, as far as possible by personal visits, the full use of all land suitable for horticultural cultivation, to assist small cultivators in obtaining supplies of seeds and tools, to help in finding the necessary labour and to promote, through the agency of Parish Councils and associations of local residents, the formation of Food Production Societies or Committees in every village and suburban district in the country.

In some counties a considerable amount of attention is already being devoted to the needs of small cultivators, and, in such cases, it is hoped to supplement rather than supersede the work of existing organisations. But, in other districts, little or no organised effort is being made, and it is considered desirable that in every district there should be some man or woman who could be regarded as definitely responsible for promoting the horticultural side of food production.

It is obviously desirable that such Representatives should act in close co-operation with the existing County Organisations, and I am to ask, therefore, that your Committee will be good enough to suggest to me the name and address of a suitable person in each rural and urban district in your County who would be willing to volunteer for the post of Horticultural Representative of the Department. It is hoped that the Horticultural Representatives would be co-opted on the War Agricultural Committee of their district if they are not already members.

Volunteer service is asked for, but, if necessary, the Department will be prepared to pay small honoraria, not exceeding £10 in any one case, to the Representatives towards their out-of-pocket expenses.

I am, etc.,

FREDERICK KEEBLE, *Director of Horticulture.*

Expert Advice on Gardening.

THE Food Production Department of the Board of Agriculture, in co-operation with the Royal Horticultural Society, has organised a body of expert gardeners who are giving free instruction and advice to allotment holders and rural, urban, and village food production societies. The "Panel of Patriotic Gardeners," which has been formed for this purpose, already numbers over 1,000 and comprises :

1. Gardeners who give advice and instruction in their immediate neighbourhood.

2. Itinerant instructors who are prepared to give advice in any part of the country.

The services of these advisers are given free of expense to any society or association engaged in the work of food production. Individuals who require advice are expected to defray out-of-pocket expenses of the instructors. Application for instructors should be made to the Director of Horticulture, Food Production Department, 72, Victoria Street, London, S.W. 1. It will be of the greatest assistance if neighbouring societies will arrange to make joint application for advice on consecutive days.

Importance of Gardening: National Service Regulations.

THE Director-General of National Service has agreed to the following recommendations, made by the Department of Food Production, on the subject of gardeners and National Service :—

A gardener exempt from military service who is cultivating not less than 1 acre of ground devoted exclusively to vegetables will be recognised as doing work of national importance, and instructions will be issued that gardeners who fulfil this condition should be left to continue their work. The acre may be either wholly in a private garden or part in a private garden and part in another private garden or allotment.

Similar consideration will be extended to a gardener, who, though cultivating less than 1 acre of vegetable garden, places his spare time services for the purpose of advice and instruction at the disposal of the local Food Production Society or other organisation formed for the purpose of increasing the vegetable food supply. Vacant situations which admit of the carrying out of these conditions may be filled by men who have enrolled as National Service Volunteers.

Except in the case of luxury fruits and crops, provision will be made for the similar retention of the minimum number of skilled men necessary to maintain cultivation in fruit gardens, fruit plantations, market gardens, and fruit and forest tree nurseries, and also glasshouses put to the use of essential food production.

On the other hand, luxury gardening, bedding out, lawn tending, path sweeping, path rolling, etc., will enjoy no consideration whatever ;

on the contrary, in the event of places where gardeners are engaged in such work becoming vacant, they will not be allowed to be filled by men within the specified ages. It is not intended, however, to discourage more than circumstances necessitate the upkeep of collections of plants of great rarity or value, the possession of which in this country is a great asset to the horticultural industry.

PRICES.

Sale of Chopped Hay, and Oat and Wheat Straw in Great Britain.

THE Army Council have issued an Order, dated 14th March, to the effect that on any sale in Great Britain of hay and oat straw and wheat straw, chopped or chaffed and mixed, hereinafter called "Chop," and where such "Chop" does not contain more than 20 per cent. of straw, the price shall not exceed such prices as are set out in the appended Schedules.

The prices are deemed to include all costs and charges for "Chop" delivered on to the purchaser's premises, excepting that where it is delivered in returnable sacks or bags, a sum equal to 7*s*. 6*d*. per ton may be added to the prices in Schedule 1, and of one halfpenny per stone to the prices in Schedule 2.

Schedule 1.—Maximum prices per ton which a dealer or retailer may not exceed for quantities of 10 cwt. and upwards for "Chop":—

England, £7 10*s*.
Scotland, £7 2*s*. 6*d*.

Schedule 2.—Maximum prices per stone which a dealer or retailer may not exceed for quantities of less than 10 cwt. for "Chop":—

England, 1*s*.
Scotland, 11½*d*.

Winter Milk Prices.

THE President of the Board of Agriculture and the Secretary for Scotland have considered with the Food Controller the subject of milk prices and the maintenance of the supply, and have agreed to the following statement:—

The prices to be fixed for next winter will be considered by the Agricultural Departments in good time before the period for making contracts arrives, so as to make the maintenance of milk production certain, and commercially profitable in comparison with other branches of the farming industry.

The Food Controller is issuing an Order amending the Price of Milk Orders, 1917, so that the increase in prices sanctioned by those Orders is based on the summer prices of 1914 instead of those of 1913. (See also below.)

Contract Prices for Winter Milk.

THE Food Controller, acting on the advice of the English and Scottish Boards of Agriculture, gives notice that, unless the prices of feeding stuffs are in the meantime substantially reduced, the winter contract prices for milk in 1917–18 will be not less than 1*s*. 8*d*. per gal.

Milk producers are also reminded that the Food Controller has already decided that, owing to the weather, the month of April is included in the winter months of 1916–17, on which winter contract prices are payable.

Price of Milk.

THE Food Controller announces that it appears from information which has reached the Ministry of Food that farmers in some cases are under a misapprehension regarding the summer prices of milk as fixed by the recent Order. It is therefore desirable to explain that the maximum price of milk sold wholesale in the coming summer will usually be 6½*d.* per Imperial gallon above the price which the farmer obtained in the summer of 1913. This will be the maximum price for milk delivered on the premises or at the railway station of the buyer under a contract to supply a minimum quantity. In the case of milk sold under other conditions the farmer may not charge more than 5½*d.* per gallon above the price of the summer of 1913. It is a summary offence against the Defence of the Realm Regulations to charge or ask a higher price than the maximum permissible under the Price of Milk Order.

Maximum Retail Price of Swedes.

THE Swedes (Prices) Order, 1917, made by the Food Controller, provides that, except under the authority of the Food Controller, no person shall sell or offer to sell any swedes or swedish turnips at a price (including the cost of bags or other packages) exceeding the rate of 1½*d.* per lb.

Official Prices for Maize.

OWING to the increased use of maize flour for bread-making the supply of maize available for feeding stock is likely to be much reduced in the near future, and the Board of Agriculture consider it desirable to take steps to protect purchasers of maize against excessive charges. The Board propose to notify weekly the price at which maize is sold at the ports of arrival by the selling agents of the Royal Commission on Wheat Supplies, and to indicate the additional charges for railway transport to the principal inland centres and allowances for cost of handling as may be considered reasonable.

Any purchaser of maize who considers that he is asked to pay an excessive price for maize should furnish particulars to the Director-General of Food Production, 72, Victoria Street, London, S.W. 1.

PASTURE LAND.

Breaking up of Pasture Land.

IN reply to an inquiry as to the protection against loss of landowner and farmers whose pasture land is broken up by an executive committee under the Cultivation of Lands Order, 1917, the following Letter has been addressed by the Board to Lord Desborough, the Chairman of the Land Union :—

I am directed by the President of the Board of Agriculture and Fisheries to say that he has received your letter forwarding the following resolution which has been passed by the Committee of the Land Union:—

Having regard to the uncertainty which prevails among persons interested in land as to their position in the event of permanent pasture being compulsorily, or at all events without the consent of the owner, broken up, the Land Union will be glad to be officially informed what steps are being taken to protect owners and farmers from loss if, owing to a fall in prices, the land becomes in a few years' time unprofitable as arable land, and it becomes necessary to go to the expense of again laying the land down to pasture.

Mr. Prothero desires me to send you the following statement of his views on the subject, which he will be glad if you will communicate to the members of the Union.

While improvement in methods of tillage would, no doubt, result in a considerable increase in food supply, there can be no substantial increase in gross production without adding to the arable area. An actual addition to the land under the plough is, therefore, urgently needed, and Mr. Prothero is sure that landowners will, as a body, recognise the paramount claim of the necessities of the nation.

Powers have, therefore, been conferred on War Agricultural Executive Committees enabling them to require the breaking up of grass land, and, in the hands of practical agriculturists, Mr. Prothero feels sure that these compulsory powers will not be abused. But in carrying out their powers, the Committees have been instructed that they should not sanction the breaking up of meadow land or grass land which can more profitably be used as pasture, that their main object should be to secure in the first place the best possible cultivation of the existing arable land, and that they should not authorise the breaking up of grass land without considering whether, in view of the shortage of labour, etc., it may not be more profitable to improve it as pasture.

Mr. Prothero hopes, however, that, wherever practicable, committees will authorise the breaking up of any grass land of indifferent quality which, if broken up, would probably yield not only a greater supply of food, but more profit would be obtained from the land in its present condition.

The procedure which committees have been advised to adopt in dealing with applications from tenants who desire to break up grass land is that they should satisfy themselves that the permission of the landowner has been asked and refused, and that they should then arrange for the land to be inspected on behalf of the Committee by a practical farmer together with a qualified local land agent, surveyor or valuer, notice of the application being given to the landowner. If the Committee decide that it is desirable in the national interest to authorise the breaking up of the land, they can issue a direction to that effect which protects the tenant from any action or proceedings in respect of the consequent non-fulfilment of his contract of tenancy. (See Section 1 (2) of the Defence of the Realm (Amendment) No. 2 Act, 1915.)

If a landowner thinks that he can establish a claim for compensation for loss due to the action of the Executive Committee, he can place the matter before the Defence of the Realm (Losses) Commission.

Mr. Prothero hopes that this statement will show that there is no reason for alarm on the part of landowners, and that the policy of the Government in endeavouring to secure increased production from the land will be carried out with due safeguards for the interests of all concerned.

I am to add that Mr. Prothero recognises that any substantial measures of success in the direction of increased production must depend largely on whether assurances can be given to agriculturists that, if they adopt those forms of cultivation which are most beneficial from the national point of view, they will be protected from the risk of such cereal prices as ruled at the end of the last century and the beginning of this. This aspect of the matter is receiving Mr. Prothero's careful attention, and he will not fail to see that its importance is impressed upon the Government.

HOPS.

THE President of the Board of Agriculture and Fisheries has addressed the following Letter to all hop-growers :—

Appeal to Hop Growers.

Numerous representations have been received by Mr. Prothero as to the effect which the Regulations restricting the output of beer in the current year will have upon the demand for hops. The amount of beer which may be brewed this year has been fixed at 10 million barrels, and the hops required for this quantity of beer would be grown upon about half of the present acreage under hops. There exists also a considerable stock of hops in store. If the growers crop anything like their present acreage of hops the amount produced would be so much in excess of any possible demand that every grower would suffer heavy loss and might find his hops unsaleable.

At the same time the national need for the maximum production of food calls for the devotion of as much as possible of the rich, highly-manured hop land to the growth of crops which serve directly or indirectly for human food. Mr. Prothero understands that many growers have already begun to grub their hops and replace them by another crop. Owing to the shortage of labour grubbing cannot be carried out universally at the same time. Mr. Prothero does not desire such a complete destruction of the crop as would render the speedy regeneration of the industry impossible when the War is over. As a temporary measure potatoes, vegetables, root crops, and even beans can be grown between the rows without pulling the bines up, but leaving the plant to grow for another season.

Mr. Prothero considers that the interests of the industry and the nation will best be served by reducing the acreage to be cropped with hops during the present season by at least one half. This reduction should be spread as equally as possible among the farmers now growing hops. You are therefore asked to consider to what extent you can participate in this general reduction, and to that end to forward on the accompanying form a statement of (1) your acreage under hops in 1916, (2) the acreage you propose to crop in 1917, and (3) the acreage you have grubbed or propose to grub this season.

THE following Memorandum, dated 13th March, was issued by the Food Production Department of the Board to War Agricultural Executive Committees in the hop-growing counties :

Legal Position as to Grubbing Hops.

Mr. Prothero has received inquiries as to the procedure to be adopted by tenant farmers who are willing to assist in maintaining the food supply of the country by diminishing their acreage of hops and utilising the land for cereals and vegetable crops, but are deterred from doing so by the risk of liability under their contracts of tenancy.

In such cases the proposed cultivation should be submitted to the War Agricultural Executive Committee under section (2) of Regulation 2M, so that in proper cases a direction may be given by the Committee which can be relied on by the tenant as an answer to any claim by the landlord for breach or non-fulfilment of the contract of tenancy. This matter is at present regulated by section 1 (2) of the Defence of the Realm (Amendment) No. 2 Act, 1915, but it is intended under the Courts

(Emergency Powers) Bill to extend the scope of that provision so as to cover all claims arising out of compliance with directions given by War Agricultural Executive Committees under the powers conferred by the Defence of the Realm Regulations.

MISCELLANEOUS.

Agricultural Tenancies.

THE President of the Board of Agriculture and Fisheries has received from tenants of agricultural land, who have lately had notices to quit, inquiries as to their position in view of the recent declaration by the Prime Minister on the subject of the agricultural programme of the Government. The Prime Minister indicated that Parliament would be invited to regulate the raising of rents by requiring that the consent of the Board of Agriculture and Fisheries, to be given on certain definite principles, should be obtained to such increases. The details of the proposed legislation, however, have not yet been settled, and the Board are not in a position to state how far it will affect the enforcement, after the commencement of the legislation proposed, of previous agreements for increase of rent or of notices to quit recently given.

The Board apprehend that in some cases notices to quit have been served by landlords merely with the purpose of putting themselves in a position to bargain as to future rent, and that both the owners and tenants would desire to continue their present relations if the question of rent could be settled. The tenants, however, in view of their uncertainty of tenure and inability to ascertain how their position will be affected by legislation, often feel themselves precluded from making the additional effort which the country requires at this time. In these circumstances the Board hope that the notices may be withdrawn in those cases in which tenants agree to pay such increase of rent (if any) as may be sanctioned by the Board hereafter, with due regard to any legislation dealing with this matter during the present Session.

Short Term Credit for Farmers.*

THE following Memorandum, dated 16th March, was issued by the Food Production Department of the Board to War Agricultural Executive Committees in England and Wales:—

1. The President of the Board of Agriculture and Fisheries desires to inform War Agricultural Executive Committees that arrangements have been made with the principal banks, and approved by His Majesty's Treasury, whereby the banks will afford special credit facilities to farmers, against a Government guarantee, for the purposes, and subject to the conditions, set out below.

2. The main object of the scheme is to promote the increased production of wheat, oats and potatoes by providing credit facilities for the purchase of seeds and artificial manures. This will not prevent committees from recommending similar advances in respect of other crops, the growth of which in special cases may be a matter of urgent national importance; but in any case credit will only be given for the purposes

* See also p. 91.

stated, and no advances will be made for the payment of wages or other general purposes of cultivation.

3. Any farmer desiring to avail himself of the facilities will apply to the Executive Committee of the War Agricultural Committee for his county, stating :—

(*a*) The description and quantity of the fertilisers or seeds that he wishes to procure, and the source from which he suggests they should be obtained ;

(*b*) The class and acreage of the crop in respect of which the expenditure is to be incurred ;

(*c*) The reason for seeking assistance in obtaining special credit ;

(*d*) The name of the bank (if any) at which he has an account, or, if he has no banking account, the bank at which he would wish the credit to be provided.

4. The Executive Committee, after such inquiry as they may deem necessary, having regard to the purpose of the proposed expenditure and the position of the applicant, may approve the provision of credit, and in that case they will authorise the applicant to order from any firm or society approved by the Committee, goods of the description and value to be specified in the authority. It is suggested that use should be made of well-established co-operative trading societies, and committees will do well to draw up a list of such societies, as well as private traders, with whom they would approve of transactions taking place.

3. The applicant will place his order with the approved firm or society, together with the letter of authority, and request them to send to the Executive Committee the invoice announcing despatch of the goods. The Committee will endorse the invoice to the bank nominated and forward it to the applicant. The latter will present the endorsed invoice to the bank, who will pay it, and take from the applicant a promissory note agreeing to repay the amount with interest at 5 per cent. per annum on a specified date.

6. The banks named in the appended list have signified their willingness to make advances to farmers recommended by the War Agricultural Executive Committees at 5 per cent. per annum for a period not exceeding nine months, against a guarantee from the Government. The banks will be ready, at the request of the Executive Committee, to supply any information at their disposal with regard to the circumstances of an applicant, but they state that they cannot undertake any responsibility in giving such information.

7. The War Agricultural Executive Committee, in dealing with applications in accordance with paragraphs 4 and 5, will act on behalf of the Board. In the event of there being any delay on the part of a farmer in meeting his obligations under the arrangements indicated, the banks will themselves take all such steps as they would in ordinary circumstances take to recover the debt due to them, but in any case where the repayment of an advance is not secured, the Board will make good their guarantee.

8. More detailed instructions, together with suitable forms, will be sent to Executive Committees at an early date, but in the meantime this Memorandum will enable the committees to deal at once with any applications that may come before them.

Syrup for Bees.

THE Board of Agriculture remind bee-keepers who wish to make syrup for feeding their bees that (by permission of the Food Controller) special candy is obtainable for that purpose. This candy is so coloured and medicated as to be unfit for human food, while quite harmless to bees. It is sold by Messrs. James Pascall, Ltd., 100, Blackfriars Road, London, S.E. 1, at the rate of 10*d*. per pound. Syrup for spring feeding can be made by breaking up a 1 lb. cake of candy in 15 oz. (¾ pint) of hot water. The candy should be entirely dissolved and the syrup quite cool before it is given to the bees. For autumn feeding only 10 oz. of water (½ pint) should be used to 1 lb. of candy.

FEEDING STUFFS AND LIVE STOCK.

The President of the Board of Agriculture and Fisheries urges every Farmer and Stock-keeper to take immediate steps to meet the coming shortage of Feeding Stuffs.

OWING to the lack of tonnage and the necessity of restricting imports to the essentials of food and munitions of war, the farmer must be prepared for a reduced importation of feeding stuffs during the coming year of at least a million tons. In addition to this loss the milling regulations will deprive the industry of about half a million tons of offals, barley, maize, etc., which were formerly available for live stock feeding. This reduction of a million and a half tons represents about one-sixth of the total amount of concentrated feeding stuffs that were at the farmers' disposal before the War. At the same time the Board of Agriculture Census shows that in last June the numbers of live stock in the country were rather larger than ever before.

In the present national crisis it is necessary to bring in human food rather than raw materials for food, such as feeding stuffs for live stock, which can only be converted into a much smaller weight of human food. This decision will not be relaxed as long as the shortage of tonnage continues and the effect of the enemies' submarine campaign remains uncertain.

In view of the scarcity of feeding stuffs, it may become necessary to resort to some method of rationing the supply. The President is anxious to avoid this step if possible, because rationing always means great waste of power in organisation, much disturbance of the industry, and many cases of individual hardship.

Rationing can only be avoided if farmers generally will determine to reduce their individual demands upon the limited stock of feeding stuffs, just as the voluntary action of the people has been appealed to by the Food Controller in order to reduce the consumption of meat and bread in the country. Some men may be selfish and unpatriotic enough to observe no restraint in the consumption of feeding stuffs by their live stock; but, provided their numbers are few, it will be better to suffer some unfairness than resort to rationing.

The President therefore urges each farmer to think out for himself how far he can assist the industry in this national need by reducing the consumption by his stock of concentrated feeding stuffs, such as all kinds

of cake, corn, and meal. It may be assumed that the restriction of supplies will fall mainly upon oats, barley, rice, maize and similar materials, but that the supply of oil seeds and cakes is likely to be less affected.

The shortage of feeding stuffs, which will become more pronounced as the season advances, renders it essential that farmers generally should adopt the policy of getting their live stock as far forward as possible upon the grass, green crops and roots of this summer and autumn. There will be a large call for home-produced meat, both for civil and army needs, as soon as it can be got ready, and stock raisers are expected to take every step to prepare to meet this demand. It will be necessary to effect a substantial reduction in the head of live stock in the country before next Christmas. This reduction should in the first place fall on the animals that are not wanted for breeding purposes. All such cattle (other than milch cows), sheep and pigs that can be got into reasonable condition for slaughter on the crops grown this season should be sent to market. Breeders are urged to aim at retaining for the future their younger and more promising animals, but to prepare for market their older animals, whose period of usefulness for breeding is drawing to a close, even though, under less difficult conditions as to food, they would be bred from for a year or two longer. To assist this necessary reduction in the number of cattle the Order restricting the sale of calves has been withdrawn, and only such calves as are of good quality for future milk or beef production or for breeding should be carried beyond the stage of veal.

The President is conscious that the advice to the farming community to reduce their live stock cannot be welcome, but it is dictated by a full consideration of the national needs at the present time. The long continuance of the wintry weather makes it doubly difficult for farmers to pursue the policy indicated, but he trusts that they will realise the gravity of the situation, and, putting their own inclinations aside, will co-operate in thus securing the needed supply of meat during the late summer and autumn and in reducing the head of stock that has to be carried through the winter.

In view of the necessity for economising food, the President is of opinion that all future fat-stock shows should be at once cancelled, and that the practice of offering prizes at the Christmas auction marts should be entirely abandoned. It would be undesirable to interfere with the sales of breeding stock, either of horses, cattle or sheep; but the President requests that the committees and other bodies in charge of such shows will take immediate steps to make it known that all animals ought to be shown in store condition, and that animals, on which food is wasted in order to bring them into high condition, will be disqualified and withdrawn from the sale. Only by the strict enforcement of some such condition can a stop be put to the waste of food so generally incurred in the feeding of breeding animals for show purposes.

The President appeals to every farmer to help in a united effort to meet a difficult situation. The Food Production Department of the Board of Agriculture and Fisheries is preparing to issue more detailed advice on the points enumerated above; but it is only by the willing determination of every farmer to subordinate his own requirements to the general weal of the industry that a serious danger can be met.

Economy in Feeding Stuffs.

IN view of the shortage of feeding stuffs, to which attention is called above, the President of the Board of Agriculture and Fisheries suggests that economy can best be effected in the following directions :—

(1) *Horses.*—Working horses must be so fed as to keep them fit for their work, but this can be done on a much smaller allowance of concentrated food than is commonly used by many owners. Every effort must be made to reduce the ration to the smallest limit consistent with efficiency. All pleasure horses should be turned out to grass, as soon as the season renders it possible. No corn can be spared for horses not engaged in productive work.

(2) *Milch Cows.*—It is necessary to take every step to maintain the milk supply, especially for next winter. The Food Controller has promised that the price of milk for next winter shall not be fixed at less than 1*s.* 8*d.* per gal., and this price will be raised should the weather or the shortage of food render it necessary. Having in view the Food Controller's undertaking that the price shall be such as to render the production of winter milk remunerative, the President trusts that every milk producer will take steps to maintain his milking herd. In this direction only there should be no restriction in the feeding such as would cause a reduction in the production of milk. Economy is, however, possible (i) by maintaining the cows as far as possible upon roots, green food and hay grown on the farm ; (ii) by adjusting the ration to the milk yield, and by regular checking of the rations given. Cake should not be given to milch cows on the grass until there are signs that the milk yield is falling off from lack of keep.

(3) *Other Cattle.*—Large savings can be made in the amount of concentrated feeding stuffs usually consumed by cattle. The chief openings for economy are as follows : (*a*) Cake and other concentrated foods should not be given to store cattle other than calves until the final stage of fattening ; (*b*) cattle should be sent to market in a less finished condition than has been customary, using smaller quantities of cake. Lean meat and a smaller proportion of dead weight are more economical to the Nation than prime beef, which, under present conditions, is an unpatriotic luxury.

(4) *Sheep.*—Sheep should be fattened as far as possible on foods grown upon the farm with a minimum of cake or corn. Leaner meat and earlier slaughter are necessary. Lambing for next season should be deferred until there is a prospect of keeping the ewes and lambs without the extensive use of concentrated foods. The production of early fat lambs should be guided by the same consideration.

(5) *Pigs.*—Materials such as barley or maize that can be used directly for human consumption should not be fed to pigs or any other farm stock. Pigs, however, can be very largely fed upon green stuffs, roots, silage, whey, scraps and waste generally, with a minimum of meal.

The President regards it as very important that every farmer should take his horse-keepers, shepherds and stockmen into his confidence, and impress upon them the importance of their help by keeping to the rations of horse corn and feeding stuffs which they are allowed. By fastening up in stables or mixing sheds the notices which will be issued with regard to the feeding of horses and stock, every man would be shown that he is being asked to assist the nation and not only his employer.

Notes on Crop Prospects and Live Stock Abroad.

THE *Bulletin of Agricultural and Commercial Statistics* for March, 1917, issued by the International Institute of Agriculture, contains particulars concerning the production of cereal crops in 1916. The countries for which estimates are available are as follows :—In *Europe*—Denmark, Spain, France, Great Britain, Ireland, Italy, Norway, Netherlands, Rumania, Russia in Europe (48 Governments), Sweden, Switzerland ; in *America*—Canada, United States ; in *Asia*—British India, Japan ; in *Africa*—Algeria, Egypt, Tunis.

Wheat.—The total production in the above-mentioned countries is estimated at 322,010,000 qr. in 1916, compared with 426,529,000 qr. in 1915, a decrease of 24·5 per cent.

Rye.—In the specified countries, excluding Great Britain, Rumania, British India, Japan, Algeria, Egypt, and Tunis, the total production is placed at 117,808,000 qr. in 1916, against 124,405,000 qr. in 1915, a reduction of 5·3 per cent.

Barley.—In the above-named countries, excluding British India, the production is estimated to amount to 130,477,000 qr. in 1916, against 142,012,000 qr. in 1915, or a decrease of 8·1 per cent.

Oats.—The total production in the above-named countries, with the exception of British India and Egypt, is estimated at 336,411,000 qr. in 1916, or a reduction of 12·9 per cent. compared with the previous year, when it amounted to 386,222,000 qr.

Maize.—In Spain, Italy, Russia in Europe (48 Governments), Switzerland, Canada, United States, Japan and Egypt, the production is placed at 331,413,000 qr. in 1916, compared with 382,826,000 qr. in 1915, the decrease being equal to 13·4 per cent. In Argentina and Australia the production is estimated at 7,854,000 qr. in 1916-17, against 19,587,000 qr. in 1915-16, or a reduction of 59·9 per cent.

Sowing of Winter Cereals in the Northern Hemisphere.—The areas estimated to have been sown with winter *wheat* in 1916-17, compared with the areas sown during the corresponding period of 1915-16, expressed as percentages, are as follows :—Spain 103, France 85, England and Wales 86, Switzerland 105, United States 102, India 108, Japan 100 ; with *rye*—Spain 90, France 90, Switzerland 105, United States 121 ; with *barley*—Spain 89, France 110, Switzerland 106, ; Japan 88 ; with *oats*—Spain 98, France 95.

Live Stock in Spain.—The numbers of farm stock in 1916 are as follows (the corresponding numbers in 1915 being shown in brackets) :—Horses, 488,715 (512,453) ; cattle, 3,070,903 (2,926,170) ; sheep, 16,012,277 (15,994,608) ; pigs, 2,814,465 (2,883,081). (*Bulletin of Agricultural and Commercial Statistics*, March, 1917.)

Argentina.—The yields of wheat, oats, maize, and linseed for 1916-17 are officially estimated as follows :—Wheat, 8,750,000 qr., as compared with 21,560,000 qr. last season ; oats, 3,340,000 qr., against 7,925,000 qr. ; maize, 6,800,000 qr., against 18,600,000 qr., and linseed, 102,000 tons, against 998,000 tons last season. (*London Grain, Seed and Oil Reporter*, 22nd and 28th March.)

Agricultural Conditions in England and Wales on 1st April.

THE Crop Reporters of the Board, in reporting on agricultural conditions in England and Wales, state that the unfavourable weather during March hindered operations in the field, although a good deal was done in preparation of the land for crops. Some spring corn was got in, but not much, and here and there a commencement was made with planting potatoes.

The early sown wheat still continues satisfactory as a rule, but the late sown is a thin and poor plant. The area sown with wheat is estimated to be about 8 per cent. below that of last year. The crop is very backward, and some damage seems to have been done by the March frosts. Winter oats and beans also suffered considerably from the frosts.

Seeds are very backward, and a good deal of damage was done by the frosts. There generally is a good plant, however, and in many districts it is expected that they will show a good recovery with warmer weather.

The fall of lambs appears to be generally quite up to the average, but the very cold weather has been all against the lambs, and considerable mortality is reported among both ewes and lambs, particularly in the north. Ewes are mostly in poor condition, and, again more especially in the north, they are reported to be short of milk.

According to the Board's *Monthly Agricultural Report* for 1st April, 1917, the supply of labour is very deficient, but the situation has been greatly relieved in nearly all parts of the country by the temporary release of men from the Army for farm work.

Agricultural Labour in England and Wales during March.

The following local summaries give details regarding the agricultural position in the different districts of England and Wales :—

Northumberland, Durham, Cumberland, and Westmorland.—The supply of labour is still very deficient, but the situation has been eased by the temporary release of men from the Army.

Lancashire and Cheshire.—Labour is everywhere short, but some relief has been given by the loan of men from the Army.

Yorkshire.—The deficiency is still felt, but soldiers have been doing good work. Temporary labour, expecially in the case of horsemen, is scarce.

Shropshire and Stafford.—The supply of labour is very short, but the situation is being relieved by the employment of soldiers and women.

Derby, Nottingham, Leicester, and Rutland.—Labour is still deficient, but much assistance is being given by soldiers in some districts.

Lincoln and Norfolk.—Labour continues to be seriously scarce, but in a few districts the situation has been eased to some extent by the release of soldiers.

Suffolk, Cambridge, and Huntingdon.—The supply of labour continues short throughout the division, but the situation is being relieved somewhat by the release of soldiers for farm work.

Bedford, Northampton, and Warwick.—Conditions are slightly better, with help from soldiers, but little work has been possible owing to the weather.

Buckingham, Oxford, and Berkshire.—The supply is short and work is backward in consequence. Military help, where available, has been advantageous.

Worcester, Hereford, and Gloucester.—The supply of labour is generally deficient, but the assistance rendered by the release of soldiers has to some extent relieved the shortage.

Cornwall, Devon, and Somerset.—The supply of labour is deficient, but the position is now being improved by the release of soldiers and the employment of women. At the Lady-Day hirings wages advanced.

Dorset, Wiltshire, and Hampshire.—The supply of labour is generally short, but the deficiency has been relieved by the release of soldiers for agricultural work in some districts.

Surrey, Kent, and Sussex.—The supply continues to be deficient, skilled men being very scarce, but the situation has been relieved somewhat by the assistance given by the military. Wages in some cases have been advanced.

Essex, Hertford, and Middlesex.—The supply of labour is deficient.

North Wales.—The supply of labour is short, but with the help of soldiers the situation is not as serious as was anticipated.

Mid Wales.—The supply of labour continues to be very short, but some improvement is reported from the releasing of Army men for farm work.

South Wales.—The help of soldiers has made the position much easier as regards labour, but the supply of labour is still deficient.

Prevalence of Animal Diseases on the Continent.

THE following statement shows that according to the information in the possession of the Board on 1st April, 1917, certain diseases of animals existed in the countries specified :—

Austria (*on the 21st February*).—Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Denmark (*month of December*).—Anthrax Foot-and-Mouth Disease, Swine Erysipelas, Swine Fever.

France (*for the period 18th February—3rd March*).—Anthrax, Black-leg, Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (*for the period 15th—18th February*).—Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Swine Fever.

Holland (*mon h of February*).—Anthrax, Foot-rot, Swine Erysipelas.

Hungary (*on the 21st February*).—Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Italy (*for the period 25th February—4th March*). — Anthrax, Black-leg, Foot-and-Mouth Disease (707 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Sheep-pox, Swine Fever.

Norway (*month of February*).—Anthrax, Black-leg, Swine Fever.

Russia (*month of September*).—Anthrax, Cattle-plague, Foot-and-Mouth Disease (58,366 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Spain (*month of September*).—Anthrax, Black-leg, Dourine, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (*month of February*).—Anthrax, Black-leg, Swine Erysipelas, Swine Fever.

Switzerland (*for the period 5th—11th March*).—Black-leg, Foot-and-Mouth Disease (2 "étables" entailing 10 animals, of which 2 "étables" were declared infected during the period), Swine Fever.

No further returns have been received in respect of the following countries: Belgium, Bulgaria, Montenegro, Rumania, Serbia.

The Weather in England during March.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
Week ending 3rd Mar.:								
England, N.E. ...	40·0	+0·9	0·04	1	—11	1	2·7	—0·2
England, E.	39·3	0·0	0·05	1	— 9	2	2·2	—0·7
Midland Counties ...	40·0	+0·5	0·11	3	— 9	2	1·7	—0·9
England, S.E. ...	40·0	—0·5	0·17	4	— 9	2	2·1	—1·0
England, N.W. ...	40·7	—0·9	0·17	4	—12	2	1·1	—1·7
England, S.W. ...	41·3	0·0	0·25	6	—14	3	1·1	—2·0
English Channel ...	43·8	—0·1	0·13	3	—13	2	2·9	—0·9
Week ending 10th Mar.:								
England, N.E. ...	30·9	— 8·8	0·73	19	+ 7	5	1·2	—2·1
England, E.	32·1	—7·9	0·28	7	— 4	4	1·7	—1·6
Midland Counties ...	31·4	—8·4	1·03	26	+14	5	1·4	—1·6
England, S.E. ...	34·6	—6·4	0·66	17	+ 3	5	2·0	—1·3
England, N.W. ...	32·3	—7·9	0·72	18	+ 1	4	1·5	—1·5
England, S.W. ...	36·6	—4·8	1·81	46	+25	6	2·4	—1·1
English Channel ...	41·1	—3·0	1·06	27	+ 8	6	2·0	—1·8
Week ending 17th Mar.:								
England, N.E. ...	39·6	—1·0	0·09	2	— 7	1	4·2	+0·2
England, E.	39·6	—1·4	0·71	8	+10	4	1·8	—2·0
Midland Counties ...	40·4	—0.9	0·24	6	— 3	3	3·2	—0·3
England, S.E. ...	41·7	—0·5	0·60	15	+ 5	3	2·1	—1·7
England, N.W. ...	40·3	—1·2	0·26	7	— 6	2	4·5	+1·1
England, S.W. ...	42·8	+0·1	0·67	17	+ 3	4	4·1	+0·3
English Channel ...	44·9	—0·3	0·58	15	+ 4	4	4·3	—0·6
Week ending 24th Mar.:								
England, N.E. ...	38·8	—2·3	0·45	12	+ 2	5	3·9	—0·5
England, E.	37·7	—3.7	0·39	10	— 2	4	4·1	— 0·1
Midland Counties ...	38·3	—3·0	0·42	11	0	4	3·4	— 0·4
England, S.E. ...	38·3	—4·1	0·47	12	0	4	5·0	+0·7
England, N.W. ...	39·5	—2·1	0·48	12	— 1	4	4·5	+0·5
England, S.W. ...	39·2	—3·6	0·27	7	—10	4	5·8	+1·4
English Channel ...	41·3	—4·1	0·56	14	— 1	4	5·5	+0·6
Week ending 31st Mar.:								
England, N.E. ..	39·0	—3·0	0·52	13	+ 3	6	4·5	+0·1
England, E.	37·7	—5·2	0·67	17	+ 9	6	3·3	—1·4
Midland Counties ...	38·4	—4·3	0·41	11	+ 1	5	3·7	—0·5
England, S.E.... ...	38·6	—5·4	0·51	13	+ 4	6	3·1	—1·8
England, N.W. ...	39·3	—3·2	0·96	25	+10	6	4·4	—0·1
England, S.W. ...	39·2	—4·8	0·60	15	0	5	5·1	+0·3
English Channel ...	41·5	—5·4	0·99	25	+13	6	4·3	—1·5

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES in March and February, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	MARCH.		FEBRUARY.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Polled Scots	17 5	16 4	17 4	16 0
Herefords	16 9	15 7	16 7	15 2
Shorthorns	17 0	15 9	16 9	15 5
Devons	16 9	15 5	16 5	15 3
Welsh Runts	17 0	15 5	16 4	15 5
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	*d.*	*d.*	*d.*
Veal Calves	—	—	—	—
Sheep :—				
Downs	15¼	14	14½	13¼
Longwools	14⅜	13½	14	12¾
Cheviots	16½	15¼	15¼	14
Blackfaced	15¾	14½	14½	13½
Welsh	15¼	13¾	14¼	13
Cross-breds	15½	14¼	14½	13½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bacon Pigs	15 10	15 0	14 11	14 1
Porkers	16 6	15 9	15 8	14 11
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Shorthorns—In Milk ...	41 18	33 3	42 6	33 14
,, —Calvers ...	38 12	30 9	39 14	31 14
Other Breeds—In Milk ...	43 1	31 17	42 10	31 1
,, —Calvers ...	29 10	27 0	29 0	27 10
Calves for Rearing	3 10	2 15	3 8	2 14
Store Cattle :—				
Shorthorns—Yearlings ...	17 0	14 18	16 5	14 13
,, —Two-year-olds...	26 11	23 0	25 5	21 16
,, —Three-year-olds	34 9	28 10	32 11	27 15
Herefords —Two-year-olds...	29 2	23 9	30 9	23 1
Devons— ,,	30 18	25 16	27 12	22 17
Welsh Runts— ,,	25 19	22 14	24 1	20 7
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Downs or Longwools ...	73 9	62 3	66 5	57 3
Store Pigs :—				
8 to 12 weeks old	35 11	27 7	30 11	23 7
12 to 16 ,, ,, ...	60 7	47 6	53 3	41 6

* Estimated carcass weight.

AVERAGE PRICES OF DEAD MEAT at certain MARKETS in ENGLAND in March, 1917.

(Compiled from Reports received from the Board's Market Reporters).

Description.	Quality.	Birmingham.	Leeds.	Liverpool.	London.	Manchester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—						
English	1st	118 0	118 6	—	119 6	120 0
	2nd	113 0	114 6	—	115 0	113 0
Cow and Bull	1st	109 6	112 0	106 6	108 0	107 6
	2nd	103 0	106 6	87 6	103 0	98 6
Irish : Port Killed	1st	—	116 6	116 0	117 0	116 6
	2nd	—	111 6	111 6	112 6	112 0
Argentine Frozen—						
Hind Quarters	1st	101 6	—	—	102 6	—
Fore ,, ...	1st	—	—	—	93 6	—
Argentine Chilled—						
Hind Quarters	1st	112 6	112 6	111 0	112 0	111 0
Fore ,, ...	1st	100 6	101 0	99 0	100 0	99 0
American Chilled—						
Hind Quarters	1st	—	—	—	116 6	—
Fore ,, ...	1st	—	—	—	104 0	—
VEAL :—						
British	1st	119 0	121 6	107 6	126 0	—
	2nd	111 0	105 6	98 0	107 6	94 6
Foreign...	1st	—	—	—	—	—
MUTTON :—						
Scotch	1st	129 6	130 6	141 0	135 6	144 6
	2nd	125 0	121 6	128 6	126 0	140 0
English...	1st	126 0	130 6	—	127 0	140 0
	2nd	121 6	121 6	—	118 0	132 0
Irish : Port Killed	1st	121 6	—	133 0	—	130 6
	2nd	112 0	—	122 6	—	123 6
Argentine Frozen	1st	106 6	—	106 0	108 0	104 6
New Zealand ,, ...	1st	86 6	—	88 0	87 6	88 0
Australian ,, ...	1st	86 6	—	—	—	—
LAMB :—						
British	1st	142 6	—	—	140 0	—
	2nd	136 6	—	—	130 6	—
New Zealand	1st	100 6	—	98 0	98 0	98 0
Australian	1st	100 6	100 6	98 0	98 0	98 0
Argentine	1st	122 6	—	116 6	122 0	116 6
PORK :—						
British	1st	136 6	135 6	127 0	127 0	126 0
	2nd	130 6	123 6	118 6	113 0	116 6
Frozen	1st	101 6	106 0	98 6	101 0	105 0

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at certain MARKETS in ENGLAND in March, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	26 6	25 6	—	—	24 0	23 0
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery—Fresh	—	—	—	—	—	—
,, Factory	—	—	—	—	196 0	—
Danish...	—	—	—	—	—	—
French...	—	—	—	—	217 6	212 0
Dutch	—	—	—	—	218 0	216 0
American	—	—	—	—	—	—
Australian	219 0	216 6	219 0	214 6	215 0	210 6
New Zealand	226 6	222 6	230 6	227 0	223 6	219 0
Argentine	—	—	215 6	213 0	210 0	205 0
CHEESE :—						
British—						
Cheddar	168 6	—	170 0	165 0	168 6	—
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	177 6	175 0	176 6	171 6
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	165 0	—	165 6	—	165 6	—
BACON :—						
Irish (Green)	145 0	—	145 6	143 0	141 6	138 0
Canadian (Green sides)	135 6	—	136 6	135 0	135 0	131 6
HAMS :—						
York (Dried or Smoked)	182 0	176 0	—	—	187 0	179 0
Irish (Dried or Smoked)	—	—	—	—	162 6	—
American (Green) (long cut)	124 0	121 6	126 6	122 0	128 0	125 0
	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
EGGS :—						
British	—	—	—	—	20 5	18 9
Irish	19 10	—	19 10	18 9	19 4	18 6
Egyptian	13 4	13 1	13 7	12 3	14 4	13 6
	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
POTATOES :—						
Arran Chief	—	—	—	—	220 0	—
Edward VII.	—	—	220 0	—	220 0	—
Up-to-Date	—	—	220 0	—	220 0	—
HAY :—						
Clover	—	—	150 0	140 0	141 6	133 6
Meadow	—	—	—	—	140 6	133 0

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1915, 1916 and 1917.

Weeks ended (*in* 1917).	WHEAT.						BARLEY.						OATS.					
	1915.		1916.		1917.		1915.		1916.		1917.		1915.		1916.		1917.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	46	2	55	8	76	0	29	7	47	8	66	4	26	5	31	5	47	1
,, 13 ...	48	9	56	7	75	8	30	5	48	6	65	7	27	6	31	11	47	2
,, 20 ...	51	6	57	2	75	8	31	3	49	6	64	9	28	10	32	6	47	4
,, 27 ...	52	8	58	0	75	10	32	5	51	0	64	5	29	10	32	11	47	8
Feb. 3 ...	53	3	58	3	75	10	33	7	52	5	64	0	30	3	32	4	47	3
,, 10 ...	54	8	57	6	76	0	34	7	52	10	63	5	31	1	32	2	46	11
,, 17 ...	56	0	56	11	76	3	34	11	53	6	63	8	31	5	31	9	47	3
,, 24 ...	56	0	58	2	76	9	35	3	54	2	63	9	31	8	32	2	47	8
Mar. 3 ...	55	11	59	4	77	4	34	6	55	7	64	0	31	8	32	4	48	0
,, 10 ...	54	8	58	2	78	0	33	5	55	6	63	7	31	0	32	3	48	7
,, 17 ...	53	9	57	9	78	10	32	2	55	4	64	1	30	7	31	10	49	4
,, 24 ...	54	3	55	11	80	3	31	11	54	6	65	6	30	6	31	4	50	4
,, 31 ...	54	6	53	6	81	5	31	9	53	8	71	10	30	6	30	5	51	10
Apl. 7 ...	54	9	51	8	84	4	31	3	53	7	69	11	30	4	30	1	55	1
,, 14 ...	55	4	53	2	85	2	30	10	53	1	71	10	30	5	30	7	57	2
,, 21 ...	56	5	55	3			31	5	52	10			30	11	31	8		
,, 28 ...	58	3	56	3			32	7	53	5			31	5	32	4		
May 5 ...	60	5	55	7			33	3	53	1			32	4	32	10		
,, 12 ...	61	7	55	5			34	0	53	5			32	5	33	1		
,, 19 ...	62	0	55	0			34	1	52	10			32	8	33	0		
,, 26 ...	61	11	54	7			34	8	52	9			32	7	33	4		
June 2 ...	61	9	53	3			35	4	53	9			32	5	33	3		
,, 9 ...	60	1	51	2			34	5	52	8			32	4	32	7		
,, 16 ...	56	1	48	10			34	3	50	9			31	9	32	1		
,, 23 ...	52	0	47	6			34	4	49	10			31	9	31	3		
,, 30 ...	49	5	46	3			35	3	49	1			31	1	30	10		
July 7 ...	50	1	46	3			34	7	45	6			31	6	30	8		
,, 14 ...	52	7	48	11			35	8	47	5			31	6	31	6		
,, 21 ...	53	10	51	6			35	10	48	8			32	1	32	3		
,, 28 ...	55	3	53	5			36	1	47	2			31	1	32	5		
Aug. 4 ...	55	4	55	1			35	7	46	1			31	5	32	9		
,, 11 ...	55	2	56	7			37	0	46	11			31	7	31	2		
,, 18 ...	54	3	58	1			39	4	48	0			31	4	30	8		
,, 25 ...	51	11	59	0			38	3	47	1			30	0	31	6		
Sept. 1 ...	45	3	59	4			38	1	48	5			26	10	30	5		
,, 8 ...	43	0	59	3			37	11	51	7			26	8	31	1		
,, 15 ...	42	9	59	11			39	0	52	6			26	4	30	9		
,, 22 ...	43	3	59	4			39	8	53	3			26	1	30	9		
,, 29 ...	43	5	58	10			40	4	54	1			26	5	31	1		
Oct. 6 ...	44	1	59	2			41	0	54	5			26	5	30	9		
,, 13 ...	45	9	59	7			42	3	53	10			27	1	31	6		
,, 20 ...	48	2	60	9			44	0	53	8			28	1	31	11		
,, 27 ...	50	3	62	10			46	2	54	6			29	1	32	10		
Nov. 3 ...	51	6	66	7			47	3	56	2			30	4	34	0		
,, 10 ...	52	8	69	8			47	5	58	0			30	11	35	8		
,, 17 ...	53	6	70	9			47	11	59	8			31	3	37	8		
,, 24 ...	54	2	70	8			48	7	61	8			31	1	39	7		
Dec. 1 ...	53	7	71	3			48	11	63	1			30	11	41	4		
,, 8 ...	52	10	72	1			47	10	65	6			30	4	44	1		
,, 15 ...	53	11	73	2			47	5	66	5			30	6	45	10		
,, 22 ...	53	10	74	8			47	2	67	3			30	7	46	5		
,, 29 ...	54	9	75	10			47	5	67	5			30	10	47	4		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of March, 1915, 1916, and 1917.

—	WHEAT.			BARLEY.			OATS.		
	1915.	1916.	1917.	1915.	1916.	1917.	1915.	1916.	1917.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London ...	56 5	57 0	81 2	33 0	53 11	66 1	32 6	32 8	52 3
Norwich ...	54 5	56 3	78 2	33 9	55 2	63 3	31 1	31 3	49 2
Peterborough	53 11	55 5	79 0	31 10	53 8	64 0	30 9	31 3	49 4
Lincoln ...	55 3	57 5	81 1	30 11	54 0	65 1	30 5	31 9	50 1
Doncaster ...	53 4	57 9	79 7	30 8	52 9	65 4	29 7	31 5	49 11
Salisbury ...	53 4	56 11	78 7	33 11	53 8	64 6	33 4	31 0	48 8

Statement showing the average price of British corn, per quarter (Imperial measure) for the quarter ending Lady-Day, 1917, pursuant to the Corn Returns Act, 1882.

Wheat.		*Barley.*		*Oats.*
s. d.		*s. d.*		*s. d.*
77 2		64 11		48 2

NOTICES OF BOOKS.

Heather and Moor Burning for Grouse and Sheep.—(*Oliver and Boyd, Edinburgh, 2s. 6d.* net., postage 2½*d.*).—The need for increased food production at home has had the effect of giving the problem of heather burning more than usual prominence. This little book by Professor Robert Wallace deals with Scottish conditions and takes it as axiomatic that "the interests of grouse and sheep are identical, the object being so to manage moorland as to secure the greatest amount of vigorous growing heather, without decreasing the other useful food-plants associated with it, and thereby maintain the maximum amount of food for both sections of stock." Common heather, its rivals in moorland floras, the food of grouse, general observations on heather burning, the establishment of a burning rotation on neglected moors, and evidence of good results from treatment, form the headings of successive chapters. The volume is well illustrated. Purchasers may like to know that profits from the sale of the volume will be devoted to the funds of the Red Cross Society.

Plants Poisonous to Live Stock.—(*Cambridge University Press, 6s.* net.)—This volume, the second of the Cambridge Agricultural Monographs, by Harold C. Long, brings together information as to the poisoning of live stock by plants, from sources which have not hitherto been readily accessible. The plan adopted throughout with each plant is to discuss firstly the extent to which it is poisonous, the parts which are poisonous, and the quantities which must be eaten to cause illness; next to give the results of investigations into the toxic principle and the method of rendering it harmless; and finally to survey the symptoms which have been observed in cases of poisoning. There are also chapters dealing with plants suspected of being poisonous, the effects of plants on milk, mechanical injury, and the classification of poisons. A list of 267 references to the literature on poisonous plants concludes the volume, which contains a complete index.

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MARCH.		THREE MONTHS ENDED MARCH.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	63	66	180	168
Animals attacked	80	83	211	201
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	24
Glanders (including Farcy):—				
Outbreaks...	3	6	8	19
Animals attacked	5	18	14	58
Parasitic Mange:—				
Outbreaks	338	277	1,015	1,001
Animals attacked	706	620	2,151	2,474
Sheep-Scab:—				
Outbreaks	70	22	322	149
Swine Fever:—				
Outbreaks	244	471	553	1,078
Swine Slaughtered as diseased or exposed to infection	93	1,442	196	3,376

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MARCH.		THREE MONTHS ENDED MARCH.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	—	—	2	1
Animals attacked	—	—	2	5
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—		1	—
Parasitic Mange:—				
Outbreaks	6	5	13	22
Sheep-Scab:—				
Outbreaks	30	36	154	165
Swine Fever:—				
Outbreaks	24	22	55	53
Swine Slaughtered as diseased or exposed to infection	145	179	344	264

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HAY-MAKING MACHINERY.

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Agricultural Organiser for Derbyshire.

The various processes and operations through which the grass is passed in its conversion into stacked hay may be grouped under two headings, and it is convenient to deal with the implements concerned under the same titles :—

(*a*) *Making* processes : those performed with the object of converting green herbage into hay.

(*b*) *Carrying* operations : those securing the hay in the stack or barn.

Weather conditions largely determine the success of the work, and the amount of labour necessary to secure the crop ; and, admittedly, a good spell of fine weather is more appreciated by the farmer than any machine or labour-saving device—or supplementary labour. At the same time the possession of a set of modern hay-making appliances enables him to make rapid progress during periods of favourable weather, and while reducing hand labour to the minimum, largely prevents waste of crop by exposure.

Appliances for Making Hay.—Good hay cuts up green, waxy and sweet, with the leaf and seed fully preserved. Apart from the amount of moisture present at the stacking stage, the important factors determining the above qualities are the amount of rain and sun-burning to which the crop has been subjected after cutting.

The process of hay-making is not simply one of physical drying ; the machines used in the work indirectly affect the quality of the finished product, through the manner in which their action influences leaf-transpiration. When the leaves

of mown grass are early shrivelled up by over-exposure to the sun they cease to draw moisture from the stems, and the necessary further drying of the latter is accompanied by loss of colour and probably of nutritive value. This cutting off of the moisture outlets which lengthens the process of drying leads to over-heating of stacks in good seasons; and the principle here involved supports the growing preference for machines which make hay by aeration rather than by sun-drying.

Each of the machines used in hay-making—swath turners, tedders, side-rakes and dump-rakes—has its own special advantages, and on a large farm it may be economical to have the complete set. The average farmer, however, must study his equipment as a whole, and in making an addition select that which under his special conditions best accompanies the tools he already possesses. This article will probably be of most service where it affords such guidance.

1. *Swath Turners.*—The passing of the mower and team over the swath compresses it, and, while that is the condition in which it can best turn rain, it should be turned over on to the bare stubble as soon as the latter is dry—provided there is no reason to expect interruption in the further stages of making and securing the crop. The tedder is not an ideal machine for this purpose, as it spreads the grass over the damp as well as the dry ground and exposes too large a surface of the crop to the sun. The swath turner is superior in these respects; and, besides handling the crop more gently—which is very important with clover—it completely inverts the swath, leaving it light and open to the air.

After the first operation with the swath turner, the swath is sufficiently intact to offer some resistance to untimely rain, though that advantage cannot be claimed after a second turning. Repeated workings with this machine, however, soon effect the desired drying of the crop, even in the absence of bright sunshine. The satisfactory making of the crop in more or less intact swaths is not, however, always practicable; and under the exceptional circumstances to be here mentioned some form of tedder is almost indispensable: it is when swaths are very large, and perhaps have been wetted through by rain, that they have to be opened out to allow of the drying of the insides and to prevent them from rotting.

Most makes of swath turner are adaptable to different widths of swath and will work satisfactorily on ridge and furrow land. There are right- and left-hand patterns, and makes in

which the direction of rotation of the turners is reversible. The latter are useful, in the absence of a side-delivery rake, for putting up two to four swaths into a windrow; while they have the obvious advantage of following equally well either left- or right-hand mowers.

2. *The Side-delivery Rake.*—The usefulness of a machine working on the side-delivery principle was anticipated by the judges of the Royal Agricultural Society of England trials of haymakers at Darlington in 1895. They reported: "We . . . were much disappointed at not finding any new machine entered for putting hay and clover out of swath into windrow; there is a great want of a machine for this purpose arranged . . . to work backwards and forwards, putting, say, eight rows into one."

This comparatively recent invention is well on the way to becoming the most popular of all hay-making appliances. Its use is for air-drying the crop in small, light windrows; and it leaves little to be done by either the dump-rake or the tedder. In very good drying weather, and more frequently in the case of light crops, it is the only implement used between mowing and carting, but, as a rule, it is brought into operation only after a certain amount of work has been done with the swath turner or the tedder.

The side-rake collects over the width of two swaths and delivers the hay sideways in a straight, continuous and regular windrow, which is in an ideal state of lightness for aeration. The number of swaths first put together varies from two to five, according to the weight and condition of the crop. The row is then repeatedly moved over on to fresh ground until the hay is fit to cock or carry, the final size and position of the rows being arranged for convenience in loading. In this work the horse need never walk on the row; and the advantage of facility in rolling rows over on to fresh ground is greatly appreciated when an untimely shower is followed by good drying conditions.

This implement is much handier to work than the dump-rake, being light in draught and involving little effort on the part of the operator. It rakes clean but does not collect bottom rubbish; and the windrow made by it is not only light and free from any tendency to "pack" but is much more convenient for cocking or loading. Where a mechanical loader is used the side-rake is almost indispensable.

The use of the side-rake reduces the function of the dump-rake to that of cleaning up after carrying, for which purpose

the expanding type is, under suitable conditions, a saver of much time and labour.

Of the three patterns of side-rakes, those in which the rakes are suspended in front of the main axle (and in full view of the driver) are the handiest and the most successful in collecting on ridge and furrow land. An improved method of suspension of the rakes has, however, been recently devised, which should complete the success of the type having the rakes behind the axle.

3. *Combined Hay-makers.*—During recent years several makers have produced machines which combine more or less satisfactorily the functions of the swath turner and the tedder with those of the side-delivery rake. They consist of a side-rake with the rakes placed behind and obliquely to the main axle, and provided with reversing gear. When the rakes move in the forward direction they make a windrow or roll it over on to fresh ground, as above described; when they move in the reverse direction they turn two swaths or ted a windrow out.

The combined hay-maker is a boon to many farmers who have to consider not only the cost of the separate implements, but also the necessary shedding-room, while moving a lever is obviously simpler and quicker than changing the machine behind a horse. Given a reasonably uniform surface and ordinary crops to work upon, this machine leaves little to be desired in performing any of its three functions. It is primarily a side-rake, but it will also ted a windrow out very satisfactorily; and in opening out heavy swaths it does excellent work, when the rakes are set to flick off the top halves. As a swath turner, however, it is less efficient, as it does not invert the swaths in the same way as an ordinary swath turner, particularly when rain-beaten or "grown-through" crops are being dealt with.

Certain disadvantages apply to most combined hay-makers. Their width has been found a serious drawback in districts where gateways and lanes are narrow; the draught when the machine is in reverse gear is heavy—too heavy, in fact, for work on steep gradients; while the angular setting and method of suspension of the rakes affect the utility or the efficiency of the implement on ridge and furrow land. The last failing is already remedied in one make. In previous types the working level of the tines is adjustable at the rear end only; but in a recently-patented make both ends of the rake system are adjustable by hand levers. Moreover, spring supports are

provided, and either end will rise automatically in the event of the tines striking an obstacle.

The defects of the ordinary reversible side-rake in its swath-turning capacity have led to attempts by a number of makers to overcome them by the use of detachable sections in the rakes, in order that the swath-turning operation may be done in the forward direction. This enables the tines better to run under the swath; and, the speed being slower, the crop is handled more gently, and the draught is not increased. An improved machine of this type was awarded a silver medal by the Royal Agricultural Society of England at their Nottingham Exhibition in 1915. It was reported upon in their Journal for that year as follows: "In this machine extreme simplicity and lightness with a low selling price have been achieved, together with efficiency in work, but at the cost of some adaptability . . .

"The improvement consists in bridging the rake-bars in their central portion, *i.e.*, in the portion of the rake to be omitted when it is to be used as a swath turner, and having loose make-up pieces of rake easily inserted and fixed by a single bolt when used for side-raking. The arching keeps the bars out of the way of the swath when turning . . .

"The portions used for swath-turning are at a constant distance apart, hence a lack of adaptability which demands that for satisfactory work the machine should follow a mower cutting a certain width of swath."

4. *Tedders.*—There are three types of tedding-machine, in addition to the combined hay-maker, which can perform this function. The oldest and most familiar type is the hooded rotary machine with both forward and back action; the second has a back-kicking action not unlike that of a hand fork, and is known as the Anglo-American Tedder, or as the kicker; the latest is a rotary machine with back-raking action.

The double-action rotary machine is numerically the most important of hay-makers, and occupies a place difficult to fill. It will work satisfactorily on a ridge and furrow surface, and will either scatter grass out of swath or shake up hay that is in windrow. The overhead action is the more effective in moving the whole of the crop, but it subjects the hay to very rough treatment, and the draught is heavy. It is recognised to be unsuitable for making "seeds" hay; and on any crop it is apt to thresh out the finer (and more nutritious) parts and to destroy the weather-proof wax coating of the

stems. In some patterns of this machine there is a tendency for hay to fall down on and wrap round the fork axle when the horse stops or turns at the end of the field ; this is overcome by an improvement which allows the forks to continue revolving after the road wheels come to rest.

The kicker has the advantage of treating the crops more gently, and is known to be suitable for making clover crops. The general utility of most makes, however, is limited by their inability to work on ridge and furrow, except in tedding suitably-placed windrows, which operation they perform very well. A tedder used in Derbyshire, however, possesses an improvement which enables it to ted both swaths and windrows on uneven land ; the improvement consists in a divided frame, the level of each half of which is controlled by a small wheel running vertically under the fork crankshaft.

The new rotary tedder was exhibited at Nottingham Royal Show in 1915, where it received the award of a silver medal. Such experience of the use of this machine as is available supports the impression which its construction gives—that it it is a good general purpose hay-maker and will occupy in the future the position now held by the hooded tedder. It is light in draught, capable of good work on uneven surfaces, and handles the crop very gently, leaving it light and open.

5. *Hay Collectors.*—Prior to the introduction of the side-rake, hay was generally made while broadcast, and, when ready to lead, raked together into large cart rows with the dump-rake. In modern practice, making and gathering proceed almost simultaneously.

In certain districts commonly, and in others occasionally, it is necessary to interpose an intermediate stage between rowing and carting, that is, to put the hay into cocks of various sizes and for different lengths of time according to circumstances. In Scotland, Ireland, and the northern counties of England, the cocks or pykes are finally about cart-load size, and remain in the field some three or more weeks. This allows hay-making to proceed without the interruption of carting, and attention to be given to other pressing needs of the farm, as for instance, work among root crops. In other districts cocking is done only when partly-made hay would otherwise suffer injury from rain or dew before it was ready to stack ; or when making proceeds faster than carting, and there is likelihood of the hay being over made, or being left exposed to night dews and rains. In the case of crops like lucerne and clover, the leaves of which are

very readily lost when much exposed to the sun after cutting, cocking may advantageously be done on principle; the flow of sap from stem to leaf continues while the crop is in cock, and when the cocks are opened out complete making is soon effected; thus the stems are cured simultaneously with the leaves.

Owing to the amount of hand labour involved, cocking is frequently either entirely omitted when it ought to be done, or performed in such a manner as to be worse than useless. The possession of an up-to-date set of carrying appliances minimises its necessity, but it is desirable to call attention to certain implements available for the purpose of putting hay into cock.

(*a*) The side-delivery rake has by a recent invention been fitted with a device consisting of long-curved tines similar to those of a horse rake, which collect the hay as it is delivered by the revolving rakes. When sufficient has been gathered to form a cock, the operator presses a foot lever, which causes the collecting tines to rise and deposit their load.

(*b*) In America a pattern of side-rake is used which delivers sideways by means of an endless band or apron. This is driven through a clutch, by the operation of which the hay may be deposited in heaps.

Two simple and cheap tools, known as slide-rakes or hay-collectors, are widely used in the northern and western parts of the kingdom :—

(*c*) The tumbler rake, which has teeth on both sides of the beam, is sufficiently known to require no further description.

(*d*) The hay-collector (fig. 1) has teeth on one side only of the beam, which is provided with rigid curved handles. It consists essentially of six pointed wooden teeth a yard or so in length and some 15 in. apart, and is drawn by one horse with long chains attached to the ends of the beam. A patented device enables the implement to deposit its load by turning over and to right itself automatically by a second turning. This cheap, little tool is very serviceable in the hands of a capable operator for rapidly collecting hay out of windrow or lap cock into larger heaps which require little trimming to turn rain; and by collecting large loads from both directions field ricks or pykes can quickly be made.

Appliances for Carrying Hay.—An important difference between making and carrying processes is that, whereas making cannot be accelerated beyond certain limits without injuring the hay or danger to the stack, carrying may proceed at the

fastest possible rate as soon as the hay is ready. A complete set of appliances which expedite leading operations should therefore lessen the temptation to commence stacking too soon, and reduce the risks of over making and weather injury attributable to delay in carting.

Unfortunately for farmers with limited labour resources, housing appliances require to work in conjunction with each other, and a complete set cannot be operated to real advantage with fewer than about six men and five horses. This difficulty, however, is superable by working co-operatively.

6. *Hay Sweeps.*—Where hay is stacked in the field, this implement, used in conjunction with either an elevator or a horse fork, is invaluable for expeditious carrying. Seven men and four horses with two sweeps and an engine-driven elevator will clear an average crop of hay off 20 acres of land in a day, where half that area would be their normal capacity with wagons and pitchforks.

The standard type of hay sweep used in England has twelve metal-pointed wooden teeth, 10 ft. long and about 15 in. apart. The main frame runs on two outside wheels, and there is a rear-carriage (supported by a swivel wheel) which bears the driver's seat and the device for raising and dropping the tines. Two horses are yoked, one at each side of the implement, and as they draw it along, it scoops up the hay out of cock or windrow. When full—and, if properly manipulated, it carries about half a wagon load—the teeth are raised and the load is run to the stack, where it is unloaded by simply dropping the teeth and backing the horses. The hay sweep works best on level land, though ordinary ridge and furrow is not prohibitive. It can be folded up to pass through gateways when empty, but its working width usually prevents its use for leading crops home; and obviously it cannot be used in fields which are too small for separate stacks. On the other hand, the practice of out-stacking is coming into favour where fields are of suitable size, and where stock can be out-wintered. Stacking in the field saves labour at a busy time, but involves additional work in winter if the hay has to be brought home as required. It has been found, however, that hay is used less wastefully when that has to be done.

The sweep-rake can also be used in corn harvesting.

In addition to the implement commonly known as the hay sweep or sweep-rake there are smaller and simpler tools used for the same purpose. These are either without wheels and depend for their transport entirely upon the slippery nature

of hay stubble, or have wheels which carry only part of the weight of the load. Two implements of this kind are widely used in districts where hay is tramp coiled; (1) the hay-collector already described; and (2) an improved pattern

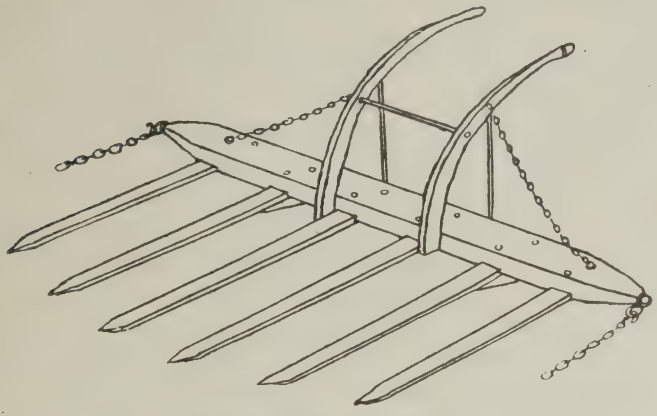


FIG. 1.—Hay Collector.

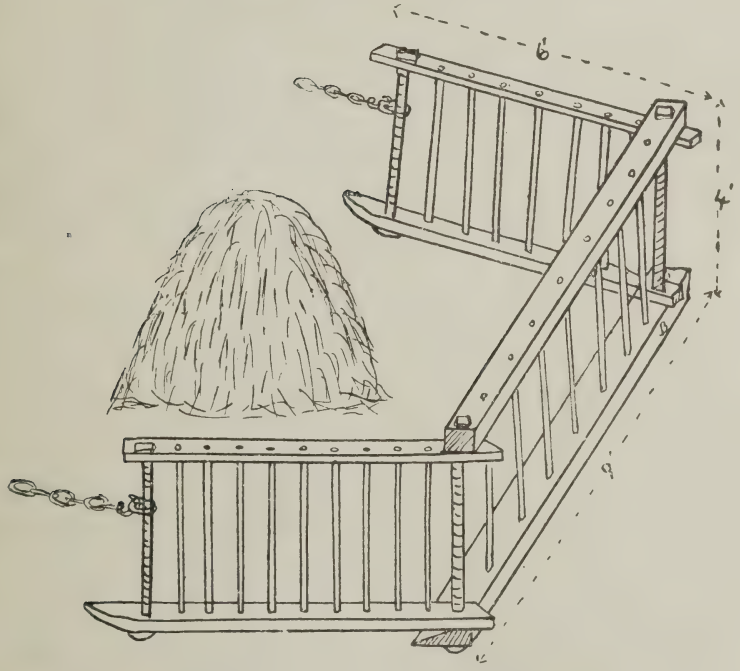


FIG. 2.—A Simple Hay Sweep.

which runs on small wheels, has longer tines, and has a collecting rack behind the beam. Both are very useful where stacks are being built in the field. Being one-horse tools, there is a limit to their carrying distance; and their use is most

practicable for clearing the first 5 to 10 acres, respectively, nearest the stack. As there is no folding up for passing through gateways, no time is lost in commencing work. Smaller farmers will find hay-collectors meet their requirements better than sweep-rakes; and it must be mentioned that 20 acres is the maximum area over which the ordinary wheeled sweep is normally workable, though probably the use of shafts instead of poles extends that limit.

In some districts simple appliances have been devised by farmers to obviate loading on to vehicles when stacking in the field. One such is here illustrated which can be constructed by any local carpenter at a cost of about £3 (fig. 2). Two horses are yoked, one to each side of the implement, and coupled about six yards apart. The driver stands on the bottom bar of the sweep, which slides along the ground and pushes the load in front of it. To unload, one horse is unhooked and the other draws the implement away, held upright by the driver. This tool will collect out of windrow and very well out of large cocks; in fact, it is desirable to break the windrow up roughly into small heaps for efficient sweeping with this implement.

Hay-loaders.—In districts where hay is led out of windrow the need is felt for a machine that economises time in loading and abolishes the heavy work of hand pitching. The machine designed for this purpose is of American origin and has in recent years been adopted by many southern and midland farmers, while British engineers are devoting their attention to its improvement.

The hay-loader attaches behind a cart or wagon, and as the combination is drawn along it rakes up the hay and elevates it on to the vehicle. An additional horse and a driver are necessary, and two men are required to spread the hay on the load. A large load is put up in about 15 minutes. For safety and to simplify the work of the spreaders a light rope and stake frame-work is fitted round the vehicle. Where gormers are used, however, side holders only are required, and these can be fitted to sag outwards, whereby a lower and wider load can be built.

For satisfactory and expeditious working of the hay-loader, the side-rake and the horse-fork must, as a rule, be used in conjunction with it. The first is necessary to make regular and straight windrows; while the latter is required to unload rapidly in order to keep the loader going, and desirable because of the difficulty of pitch-forking hay that has been spread out on the load.

The loader is best suited to large farms with large, level fields. Owing to the length of the combination it requires considerable turning room; and where hedges are high there

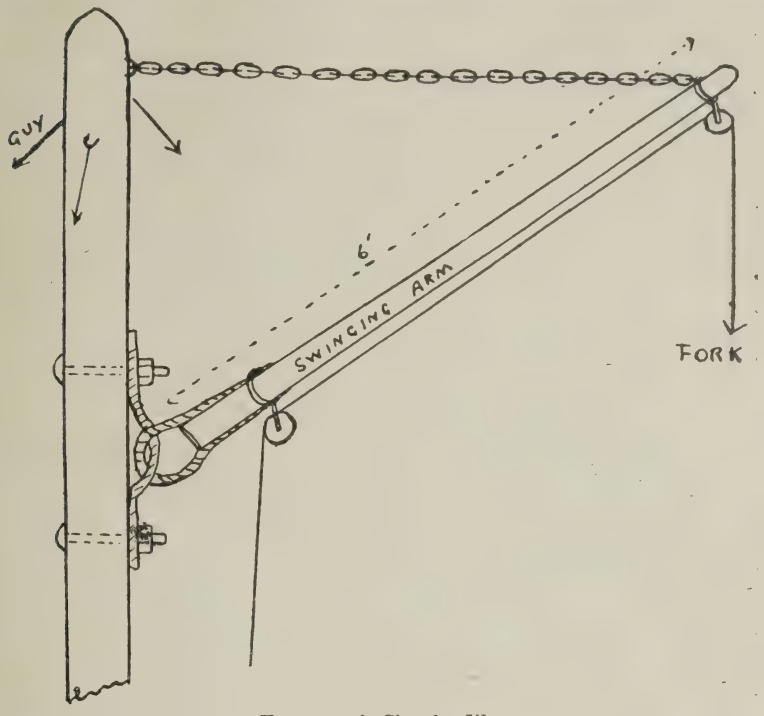


FIG. 3.—A Simple Jib.

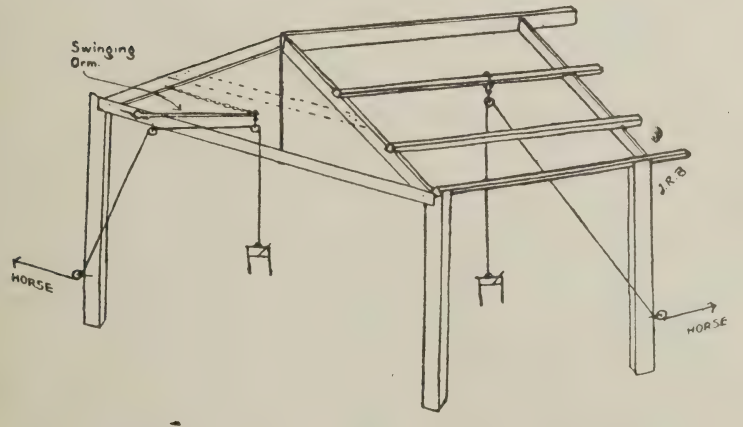


FIG. 4.—Barn Forks.

is an objection to clearing the headlands first. The draught of the combination is too heavy for a pair of horses when loading up hill; and there are difficulties in working on land

laid up in ridge and furrow. Windy days are also troublesome to users of the hay-loader. Moreover, it is obviously of little assistance when hay must be cocked, except in that its use may enable the farmer to house hay that would otherwise have to be so secured.

There are two main types of hay-loader :—

(1) The "shaker" is the older type, and consists of an inclined plane up which the hay is pushed by means of a series of oscillating bars with tines projecting from their under side. The rake-bars extend down to the ground at the rear, where small castor wheels support the frame and enable the machine to follow inequalities in the surface. At the upper end of the plane is a platform on to which the hay is delivered, whence it is pushed on to the load by the rake-bars or taken away by the men spreading. This type of machine is now receiving the attention of British makers. It is simple in construction, has positive elevation, and it does not call for special skill in its manipulation, as there are no spiked drums around which the hay may wind. It has, however, the disadvantage of handling the hay rather roughly, and is, therefore, not an ideal machine for loading "seeds" and clover hay.

(2) In the second type of loader the hay is gathered by one or more spiked drums and carried up the inclined plane by means of an endless band made of ropes and slats. There are three varieties of this pattern which differ chiefly in the method by which the hay is gathered and placed upon the elevating apron. In the latest type the hay is separately collected and transferred to the elevating band. This particular machine has further improvements which would appear to correct some of the defects of the apron type; the frame has wind screens at the sides and upper end, the elevating slats carry prongs, and the inclination of the frame has a considerable range of adjustment. The apron type of loader has the advantage of treating the hay more gently, but with the makes hitherto used it has been necessary to take precautions in working to prevent wrapping of hay round the collecting-drums, one such precaution being to clear the hay from the headlands first, in order that the machine may finish and stop with the drums empty.

Horse-fork or Unloader.—Unloading by hand is, perhaps, the most laborious of the whole series of hay-making operations. It is at the stack where delay is most frequent, owing to the absence of unloading devices, and it is obviously disproportionate to adopt sweeps or loaders unless provision is

made for correspondingly expeditious unloading. On the large farm, and certainly where corn is grown, the travelling web elevator is desirable. It can be used for stacking under barns as well as in the open; it can be driven by a small petrol engine; and patterns are available of less cumbersome and expensive type than the full-sized machine. There are, however, many farmers whose means and requirements are best suited by the horse-fork or unloader, which is by general assent of users a great saver of time and heavy work at the stack. By means of the horse-fork a youth can easily send up a wagon load of hay in about 15 minutes. It is best suited for stacks holding about 20 tons, and for expeditious working two stackers are required, with a youth to work the fork and a boy or woman to drive the horse.

The fork part of this implement is made in a variety of shapes, each of which has its advantages. The double harpoon type is probably the best, except for dealing with very short hay. A pattern recently patented, however, but apparently not as yet placed upon the market, would appear to work on a desirable principle; it consists of a corkscrew-like device with side-spears, to unload which the operator, by pulling the releasing rope, causes the screw to unwind and spread the hay about instead of dumping it.

The elevating part of the unloader at present in common use is one or other of the following types :—

(1) *Long Pole.*—A high, strong pole is fixed in the ground and secured in the upright position by three or four guy ropes. A swinging crane-jib is suspended from the top to facilitate the deposition of the loads in different parts of the stack. This type is applicable only for stacking in the open, and the hoisting of the pole is a difficult operation.

(2) *Long Jib.*—There is a short standard, supported by two guy posts, and a long, swinging jib which can be set at any angle to the standard. This pattern, which is of recent introduction, is suitable for unloading into Dutch barns as well as for building stacks. It is more easily erected and moved than (1).

(3) *Carrier.*—A rail is fixed along the roof of the barn, and a carrier with pulleys runs backwards and forwards on this. The barn has to be of suitable construction.

The arrangement of a home-made unloading device is within the skill of many farmers. In some cases the elevating part of the outfit consists merely of a long pole with a pulley near the ground and another at the top. It may be inclined towards the stack, or a locally-made jib may be fitted, as shown in the diagram (Fig. 3). When a hay barn has sufficiently strong purlins, all that is necessary is a simple pulley hooked on to a purlin, and another attached to an upright. Another arrangement is to attach a swinging jib on to the tie beams, as illustrated (Fig. 4). In the case of barns of light construction, and where the horse-fork specially made for unloading into such is not available, a workable outfit may be arranged with a short pole standing under the eaves to which is attached the short swinging jib.

ANNUAL REPORT OF THE HORTICULTURE BRANCH FOR THE YEAR 1916.*

THE conditions under which English horticulture has been carried on during the past twelve months have been exceptionally difficult. The disorganisation of ordinary civil life caused by the War and the general interruption of trade, the high price and scarcity of many articles, coupled with the irregularity of the railway and postal service, have proved serious impediments. The shortage of labour, many growers having lost 80 and even 90 per cent. of their staff, including often skilled hands who cannot be replaced, has made good cultivation practically impossible. In addition to these troubles, growers experienced one of the very worst seasons ever known. The early frosts of the autumn of 1915 were succeeded by an unusually mild winter, and in January all growth was abnormally early. Heavy rains fell in February and March, changing to snow at the end of the month, and the bad weather culminated in a violent storm which was one of the worst known for many years. Rain continued during April and part of May. The weather during blooming period was most unfavourable and so continued with short intervals for most of the rest of the year, while the temperature, especially at night, was generally low. Finally, a severe infestation of the larvæ of the winter moth, the tortrix moth,

* This article replaces the usual Annual Report of the Horticulture Branch, which is not issued separately during the War.

and certain other insect pests, caused serious losses among apple and pear growers in the south of England and the Midlands.

In spite of these highly adverse circumstances, the general condition of English horticulture proved much better than might have been expected. The export trade in nursery stock and bulbs continued at a satisfactory level, and the Inspectors report that the great commercial nurseries remain singularly free from injurious pests—an opinion which is amply confirmed by the reports received from the United States Federal Board of Horticulture on the nursery stock imported from England. The crops of some fruits, moreover, were heavy and the prices good, especially in the case of gooseberries, which were in great demand. Plums were irregular, being a heavy crop in some places and a failure in others. Prices were generally not unremunerative, though much fruit of all kinds was wasted owing to the rain and the difficulty of gathering.

Another trouble which threatened to make fruit growing unprofitable was the threatened deficiency in the supplies of sugar for preserving purposes. Early in 1916 the Royal Commission on the sugar supplies announced publicly that, owing to the impossibility of obtaining the full supply of sugar for all purposes, consumers would only be able to obtain during the current year three-quarters of the quantity of sugar obtained in 1915. Considerable alarm was at once felt by commercial fruit growers, especially those who depended upon the commercial jam makers for their sales, and representations were made to the Board on the subject. A conference was held and the Sugar Commission were able to announce that, in view of the importance of saving the fruit crop and the value of jam as an article of food, commercial jam makers would be able to get their normal supplies of sugar as in 1915, provided that it was used in the preservation of home-grown fruit. This decision had the effect of affording an outlet for the small fruit, but as only three-quarters of the sugar could be supplied at once it involved the putting down in the form of pulp of large quantities of plums and apples. Private jam makers, who did not benefit by this arrangement, moreover, were severely handicapped. Not only was sugar at a price which made private jam making expensive, but in many places sugar was almost unobtainable, so that the quantity of home-made preserves prepared during the year was undoubtedly much reduced. There is no means of

ascertaining with any degree of accuracy what the amount of fruit is which is made into jam in private families every year, and opinions obtained from different sources differ very widely. It may, however, be conjectured that it is not less than 7,000 tons, yielding perhaps 15,000 tons of jam. Much of this will, of course, be commercially-grown fruit, bought by those who prefer home-made jam but cannot grow their fruit themselves, but much is also the product of private gardens.

As it seemed unfortunate that at the present crisis so large an amount of food should be wasted, and as there was some evidence that the plum crop would be large in some places at any rate, though there was a short crop in others, an effort was made to popularise the use of glucose, sold under the name of Corn Syrup, as a partial substitute for sugar. Experiments in making jam with liquid and solid glucose in varying proportions were accordingly made, and after it had been ascertained that the best proportion appears to be 33 per cent. of glucose to 67 per cent. of sugar as the preserving medium, a memorandum was prepared appealing to the public who make jam at home to use this article and to make a strong effort to utilise the plum crop. Glucose, as is well known, is extensively used in confectionery, and in the preparation of many articles of food; it is also used in medicine. Expert advice was taken as to whether it could be safely recommended for private jam-makers, and the manufacturers and principal importers were approached to ascertain the price at which it could be put on the market in large and in small quantities. All the firms communicated with undertook to put it up in tins containing 7 lb. or 14 lb. weight, or in casks of 1 cwt. or 5 cwt. The memorandum, which gave general directions for making jam, was circulated to the Press, and through the War Agricultural Committees, and as it contained an offer to supply the names and addresses of the principal manufacturers and importers, led to a large correspondence. It is interesting to note that most of the correspondents wrote from town addresses, indicating that even if the bulk of home-made jam is not prepared in urban centres, at any rate a considerable proportion is made there— and that by families who are unwilling to forgo their customary home-made preserves. Manufacturers of Corn Syrup state that they have received many orders for tins containing small quantities, showing that the advice given by the Board has been followed in many instances.

The Board's Committee for the preservation of fruit and vegetables with which the Horticulture Branch is directly associated have conducted a number of trials in drying vegetables, the manufactured articles being supplied to the Army at the front. A large number of problems have been encountered and in the majority of cases successfully solved, and a great mass of valuable information collected which, when properly tabulated, will be found useful should there be any prospect of an industry being permanently established. The data, however, at present appear to indicate that dried vegetables are not likely to replace fresh vegetables in ordinary commerce in normal times, and that the work cannot be economically carried on except under factory conditions. Experiments in the preservation of certain fruits have been undertaken especially in connection with the plum crop, which, as is well known, is often difficult to harvest. In some years, large quantities of plums are left uncollected and unmarketed, and any means which can be devised for utilising the surplus in years of glut would be to the national advantage. The comparatively short period during which the plum season lasts, the difficulty of transport, and the difficulty of gathering the crop if abundant, as well as the limited uses to which plums can be put, make it a matter of great importance that any proposal to deal with this fruit should contemplate the disposal of a large quantity of material in a very short time. The object, therefore, of the inquiry has been the discovery of some method whereby this end can be achieved in the most economical way possible. The preliminary results attained have been successful, but owing to the peculiar circumstances attending the past season, it is not considered advisable to express any definite opinion of the practicability of the method on a large scale.

In former years a good deal of the time of one of the Board's Inspectors was devoted to the study of the pollination difficulties attending certain varieties of apples, pears, plums and apples, and much information has been collected as to the varieties which appear to be the most suitable "mate" for each other. Several experimental plantings have been made by growers on the suggestion of the Inspector and many visits have been paid by him to the orchards of commercial and private fruit growers in order to give advice on this and kindred questions. The investigation as to the varieties best suited for planting and proximity to each other has been continued this year, but the unfavourable season of last spring

made accurate observation very difficult, and the additional information collected in 1916 was almost nil. A great deal of correspondence on cultural questions took place, both officially and semi-officially, with many growers; it was chiefly of a private nature, and of no interest to the public, though it is hoped of value to the correspondents.

Diseases of Plants.—The reduction in the Board's staff of Inspectors since the beginning of the War, the release of several members of the old trained staff for military service, and the substitution of new officers ineligible for the Army, has led to the necessity for confining the attention of the outdoor staff chiefly to the more important plant diseases, to the exclusion of many questions of less immediate urgency. The administration of certain Orders of the Board has been kept up as far as possible, and when opportunity afforded, inquiries and investigations into minor diseases have been followed up, but in the latter cases only in so far as the more important duties of the staff were not interfered with. The allocation of duties under these circumstances has not been an easy task. It has been possible, however, for three reasons :—

(1) The reformed system of inspection introduced in 1913, whereby the Local Authorities have been relieved of the duty of appointing Inspectors, and the Board have undertaken the greater part of the work, has made the distribution of the inspectorate in those parts of the country where they are most needed at any time a possibility, thereby securing increased efficiency without extra cost, and uniformity of method in the place of disconcerted action;

(2) The valuable assistance rendered by voluntary workers in many places, including the county police, borough, sanitary, and market inspectors, and secretaries of allotment societies, has relieved the Board of a good deal of labour; and

(3) The decline, probably temporary only, of the virulence of certain infectious plant diseases.

The last advantage has to a certain extent been counterbalanced by the increase in the spread of other diseases due to the weather and other circumstances which are beyond control.

American Gooseberry Mildew.—The epidemic of American Gooseberry Mildew which threatened some years ago to make the culture of gooseberries in England unprofitable if not impossible, has again declined. In spite of the difficulty experienced by many growers in getting labour for the

necessary "tipping" of diseased bushes, many plantations were carefully attended to by their owners, though the work was carried out at a later season than is desirable. Very few tipping notices were issued in 1915, and none were sent out in 1916, though a printed circular letter was sent to every occupier of infected premises urging the completion of the work at as early a date as possible. It is satisfactory to know that the advice was taken in many instances by growers who have at last realised the advantages of the plan advocated by the Board. Whether the improved condition of the gardens can be wholly ascribed to the tipping carried out last year, and in previous years, it is of course impossible to say with certainty, but it is an understood fact that those growers who have consistently followed the Board's advice have in many cases begun to reap their reward, while those who neglected the work or depended on a more or less perfunctory spraying have suffered severe loss. By universal admission the quantity of diseased fruit sent to market has very much diminished, especially in London, where, however, it was found necessary to prosecute in a few cases, and reports received from the Inspectors show that this improvement was due mainly to a general reduction in the intensity of the disease. In Worcestershire especially, where the American Gooseberry Mildew Order has always been vigorously enforced by the Local Authority, the disease is now far less prevalent than formerly, and several gardens have recently been officially declared free from disease which have been under inspection for the last six or seven years. The reports from Devonshire and Cornwall also show that many gardens remained free from mildew in 1916, though disease was present in 1915. The only district where disease appears to be spreading is the Eastern Counties and a few places in the South where the infection has spread to private gardens. In many of these cases the owners have destroyed their affected bushes, so that it is hoped the disease will be kept in check. A number of groups of allotments where a few gooseberry bushes are grown were declared "infected areas" in 1915, and the regulations as to tipping which were enforced seemed to have prevented any serious spread of disease.

Several experiments in the control of American Gooseberry Mildew have been carried out during the past year, and reports on most of them have been published in the Board's *Journal*. Eyre and Salmon have made a series of tests with ammonium sulphide, a new spray which appears to check the mildew

without disfiguring the berries (*Journal*, February, 1917, p. 1098). Lees has demonstrated that the use of potassium sulphide, which has hitherto proved unsatisfactory, can be made effective if mixed with a paraffin emulsion which overcomes surface tension and covers the leaf more completely. The attention of all occupiers of infected premises has been drawn to these reports, as well as to the use of lime sulphur as an effective spray by circular letter sent out in August and September, 1916. Petherbridge and Cole have followed up a clue given last year and have experimented with the application of lime sulphur wash on affected bushes, demonstrating the advantages of spraying upwards from below instead of downwards, as is usually done. According to their evidence, which was published in the form of an article in the Board's *Journal* (November, 1916, p. 750), this method gives far better results in checking the spread of disease. Horne has also conducted a series of trials on the way in which the mildew spreads, and has shown that in certain circumstances Burgundy mixture has given good results. All these experiments look to spraying as a means of keeping the disease in check, and aim chiefly at securing a clean crop of gooseberries. An inquiry of a wholly different character has been conducted at the Pathological Laboratory at Kew with the object of ascertaining the best season for tipping, and whether the formed winter fruit of the American Gooseberry Mildew are sterile or not. A number of shoots covered with the mycelium of the mildew and bearing a quantity of perithecia were collected week by week from infected gardens in Kent and sent to the Laboratory for examination. The results showed that the perithecia are not formed in large quantities till August, and that those which persist on the bushes till late in the spring are as a rule sterile. It was also shown that alternations of mild and cold weather, such as were experienced in the autumn of 1915, caused the perithecia to burst in the autumn and release the spores in great numbers. It may be assumed that these spores died without infecting the bushes, as at that season of the year the plants could hardly be susceptible. If this deduction is correct, it would appear that the diminution in the intensity of the disease in 1916 is, partly at least, due to the season experienced in the autumn of 1915, though it is probable that the cold rainy weather that occurred in the spring of 1916 also retarded the development of the disease. It is certain that the first outbreak did not appear so early in 1916 as in former years, nor was much damage

done till comparatively late. The inquiry into the subject is being continued at the present time, and it is hoped that more definite results will be ascertained before long.

On account of the prevalence of American Gooseberry Mildew on the Continent and the present impossibility of securing any control of affected consignments from abroad, the importation of gooseberries was prohibited by Order of the Board.

Wart Disease of Potatoes.—Though the situation as regards American Gooseberry Mildew is very favourable, it is regretted that reports received concerning a second notifiable disease are much less encouraging. Wart Disease of potatoes has spread not only throughout the area known for years past to be infected, but it has appeared, spasmodically it is true, in several new places. Steps have been taken to make the requirements of the Board's Orders better known, and leaflets and warning notices have been widely distributed. Large posters, illustrated with photographic reproductions of potatoes attacked by Wart Disease and by Corky Scab, have been exhibited in many prominent places, and the Board's Inspectors, ably seconded in many counties by the police and the officers of the Local Authorities, have been diligent in searching for the disease. As a result a very large number of new cases have been scheduled, and the occupiers warned as to their liabilities. The greatest number of new cases has been found in Glamorgan, where it has not hitherto been possible to make as thorough a search as was desirable. In many parts of the county every allotment, every garden and almost every plot of cultivated land is affected, so that it is hardly possible to find any limit to the infection. In such cases groups of allotments; or rows of gardens attached to houses in a street, have been declared Infected Areas, and a vigorous attempt made to bring the whole district under control. The reports on the intensity of the disease present indicate that the infection has been active for years past. Another district in which much disease has been found is South Lancashire. The allotments and small gardens here have, as is well known, been declared infected in large numbers for some time, but several farms were reported as having infected patches on them, or even infected fields, which formerly were believed to be free. Renewed inspection has led to the discovery of very many farms bearing diseased crops, some of which were undoubtedly the cause of spreading disease to other places. It has been necessary to take legal proceedings

in several cases against the occupiers for failure to report the presence of disease. A third district in which the number of scheduled premises has been very largely increased is the county of Durham, chiefly among the collieries. It is feared that the number of cases in this district is by no means complete. Other places in which new cases have been found in proximity to old cases are Carnarvonshire, Merioneth, the West Riding of Yorkshire and Nottinghamshire. New cases have, of course, been found throughout the infected counties, but in relatively small numbers.

Sporadic cases, very puzzling as regards their origin, have been found in several new districts. Three allotments near the New Forest, at a distance of many miles from any other infected place, have been discovered. Another case was reported from near Poole. A case was reported from Swindon and another from Bletchley. Several cases were discovered at Surbiton, where an Infected Area was declared, and an outbreak took place at Putney. In none of these cases could any definite origin be traced. The owners had often never seen the disease before, and potatoes from the same consignment planted in an adjoining garden remained free from attack.

If, however, the continued spread of the disease and the inability of the Board to check its progress from place to place are disquieting, the results of the Board's policy of dealing with infected premises once the disease has been discovered are highly satisfactory. Wherever the resistant varieties of potatoes have been planted in place of the susceptible varieties, good crops have been raised. In a few instances where the wrong varieties have been supplied in error, disease has appeared, but this, so far from injuring the reputation of the kinds recommended by the Board, has led to a better appreciation of them as soon as the cause of the failure was explained. The result has been that in many allotments and cottage gardens the acreage under potatoes has increased. Instead of the miserably small crops, covered with disease, an abundant yield of sound tubers has been obtained, and in some centres growers who had abandoned potato growing in despair have taken up the culture again. In a recent prosecution in Nottinghamshire one witness declared that since the Board had imposed their regulations the return from the potatoes planted in the allotments he was acquainted with had increased threefold. The chairman of the County Agricultural Committee at a horticultural show

in Glamorgan said: "From what your men say it appears that the crop of potatoes at Mardy this year will be six times that of any previous year," while a local tradesman said that prior to 1914 his annual trade in seed potatoes did not exceed one ton, while in 1915 he sold over seven tons, all of the immune varieties. Similar statements were made at several other shows in the district. The Board are informed that the allotment holders in Stafford, who a few years ago had almost abandoned potato growing, are now taking it up again as they are able to get good crops, thanks to the introduction of immune varieties. In Lancashire the success of these varieties has given a fresh stimulus to potato planting, and similar stories are repeated from other places. This is no doubt chiefly due to the merits of the potatoes themselves, which are not only resistant to the disease but give better yields than the old susceptible varieties, though some part of the credit may be claimed for the policy adopted by the Board. Not only is a list of immune varieties sent to every occupier of infected premises but steps have been taken to prepare a series of lists of local and other dealers who stock these varieties, which is sent on application to every prospective grower, while every encouragement has been given to groups of allotment holders to form co-operative societies for the purchase of seed potatoes. A very large number of such societies has been formed as a direct result of this policy, and the result has in nearly every case given great satisfaction. It is proposed to extend this system even further this season, and a list of growers who are able to supply seed has been prepared for circulation. It is obvious that the successful cultivation of potatoes is much helped by a system which brings to the occupier of such infected premises information as to what potatoes he should plant and where he can obtain them.

The Board have taken steps in another direction to assist such potato growers. Owing to the kindness of the Board of Guardians and the master of the Workhouse at Ormskirk, an extensive tract of land has been put at their disposal for testing for immunity to Wart Disease the new varieties of potatoes that are put on the market, while the opportunity is also taken to test their cropping value. Over two hundred varieties have now been tested, and a detailed descriptive list of those which have been found to resist the attack of Wart Disease has been published. Facilities were given to farmers and others interested in the subject to examine the

crops just before lifting time, and the potatoes, both those which are resistant to disease and those which are not, were exhibited at the Ormskirk Potato Show which took place last October. The exhibit formed an important feature of the show, which attracted visitors from all parts of the Kingdom. A public conference was held on the second day of the show at which an interesting discussion on several matters relating to potato culture took place. The question of synomyms in varieties and the methods by which Wart Disease is spread were the chief subjects. During the past year several experiments were conducted at the Pathological Laboratory at Kew with the object of investigating certain problems connected with this disease, and Mr. Cotton, by whom the experiment has been carried out, was able to make some important announcements at the conference. In the first place he declared that he had been able to show that the theory which had always been held that *Synchytrium* (the causal organism of Wart Disease) never attacks any plant except the potato is incorrect, as he had succeeded in showing that two solanaceous weeds (*Solanum nigrum* and *Solanum dulcamara*) had developed distinct though small signs of disease when grown in pots containing infected soil. He also emphasized the fact that the disease may be conveyed on the soil adhering to even sound tubers, as susceptible varieties grown in pots infected with soil washed from immune tubers, grown on the trial ground at Ormskirk, had taken the disease. The discovery regarding the susceptibility of the two weeds is perhaps more interesting from a scientific than a practical point of view, but the fact that disease may be conveyed by the soil on immune tubers is both interesting and important, since it not only indicates a new source of possible infection but also further establishes the absolute immunity of the resistant varieties. Further experiments will be conducted during the coming year.

Large Larch Sawfly.—Several other investigations of a scientific and practical nature have been carried out during the past twelve months. The long and elaborate inquiry into the parasitism of the Large Larch Sawfly has been brought to a conclusion, but the results have not been tabulated. It is believed that the conclusions will have an interest for economic biologists, but their practical value is not very great as they are merely of a negative character. One of the reasons for the termination of the inquiry which has exercised perhaps the greatest influence has been the almost total dis-

appearance of the Sawfly from the infected area. Specimens can still be obtained there after search, but the economic injury to the larch plantations is unobservable.

Other Scheduled Pests.—Very little work has been done in connection with the other scheduled pests. No case of *Phylloxera*, Colorado Beetle, or *Diaspis pentagona* has been reported during the past year, and it has been found impossible to deal with cases of Corky Scab due to *Spongospora subterranea*. Many cases have been reported, and there is some evidence that under certain conditions this disease may prove troublesome and occasion serious loss, but the conditions imply not only bad cultivation but such a wet state of the soil as is unlikely to occur in normal seasons. It has not been recorded as occurring in a severe form in fields. An interesting experiment was conducted at the agricultural station of Leeds University in 1915, a report of which was not received till the present year. A consignment of seed potatoes was received, and on several specimens Corky Scab was present. Owing to the lateness of the season it was impossible to substitute fresh seed, and the land was planted with the best of the tubers, those obviously affected being thrown out. The rest were treated with a solution of formalin varying in strength from 0·5 to 2 per cent. and planted in the field. The result was inconclusive, as no tubers were discovered at harvest time bearing any sign of the scab. The rejected tubers were also made the subject of an experiment with solutions of formalin and copper sulphate. The results in this case also were of a negative character, as no disease appeared on any of the treated tubers and on only two of the untreated. From certain laboratory experiments which were conducted at the same centre it would appear that there is little to fear from this fungus except when the soil is continuously wet. In no case was the plasmodium of the fungus formed below the corky layer, and hence, where the latter is formed near the surface of the potato, the scab is bound to be superficial in character. This type of scab would be expected after a dry season when cork is very quickly formed in the potato in response to the stimulus of any irritant, such as a plasmodium, in its tissues. Where the formation of the corky layer is delayed as is the case when the potato is kept very moist, the plasmodia will naturally go deeper into the tissues of the corky layer; the tuber will then be irregular in shape, and in this way deep-seated wounds accompanied by out-growths produced by the excessive stimulus of the fungus will be the

result. This is the canker type which it is natural to expect after a wet growing season. This assumption is borne out by the experience of the present year, when the number of cases of Corky Scab attack on wet soil has greatly increased.

Pests not Scheduled.—With reference to diseases of plants not caused by scheduled pests, a number of experiments and investigations were carried out by the officers of Horticulture Branch during the past season. It is impossible to refer to them all in detail; they have covered such aspects of the subject as the identification of the cause of disease, the investigation of the biology of the organism concerned, and experimental work on likely methods of controlling in the field. Wherever possible the work is carried out in collaboration with the Pathological Laboratory at Kew, and with the advisory and research workers at the various colleges and institutions, and the results are published as they become available. To illustrate the nature of the work, brief references may be made to two problems, one entomological and one mycological, which are engaging the attention of the Board.

Capsid Bugs.—The former problem concerns the "Capsid Bug" disease of apples caused by certain bugs of the family *Capsidæ*. In January, 1915, the Board's entomologist published an article in the *Journal* giving the result of his investigations for the previous years, and showing that in all cases investigated by him the bugs *Plesiocoris rugicollis* and possibly *Orthotylus marginalis* were responsible for the damage. This year, in collaboration with Mr. Petherbridge of the Cambridge School of Agriculture, he has continued his work on the biology of the insects, and also has made a number of experiments in controlling the damage by means of various spray fluids. As has been mentioned previously, the weather in spring was extremely bad, and spraying could only be carried out under great disadvantage. In spite of this, however, it is believed that definite progress has been made, for spraying with various nicotine washes produced not only a considerable improvement in the grade of the crop but also increased its bulk. The problem of controlling these insects is, however, difficult. The damage is done soon after the insects have left their eggs and when the apples are exceedingly small. Each bug appears to be capable of doing extensive injury, and owing to its activity it is often able to hide itself in such a manner that the spray cannot reach it. Further experiments have been planned, and will be carried out as soon as

possible. A full report of the work during the year was published in the *Journal* for April, 1917, p. 33.

Apple Mildew.—The second problem concerned Apple Mildew. During the course of the summer of 1915 some observations were made by one of the Board's sub-inspectors on the prevalence of Apple Mildew in Cambridgeshire, and the presence of perithecia in considerable numbers was recorded. In order that more detailed information could be obtained, Mr. Cotton, of the Pathological Laboratory, Kew, made a visit of inspection with one of the Board's district inspectors, and arranged for a series of experiments in controlling this fungus, which appears to be on the increase in England and to have caused some losses to apple growers, the popular variety, Lane's Prince Albert, being specially liable to attack. It was found in nearly every variety of apple in Kent and Cambridgeshire, but except in the case of Lane's Prince Albert, Grenadier, Bismarck, and Cox's Orange Pippin, an expert eye was needed to discern it. A fruit-grower was found who was willing to allow some of his trees to be used for the experiment, and a number of shoots on certain trees showing the disease in various stages and degrees of intensity were marked in the spring of 1916. In order to test the spread and development of the mildew, certain infected blossom trusses were removed from some of the trees and the trusses and terminal shoots from others. The trees were kept under observation during the summer, and a diminution of the disease on the treated trees as compared with the untreated trees was noticed, those which had the terminal shoots removed being much less infected than the others. The bad weather of the summer rendered further inquiry abortive, and it seems impossible to draw any definite conclusions from this season's results.

Isle of Wight Bee Disease.—The supervision of the papers relating to Isle of Wight Bee Disease is included among the duties of the Horticulture Branch, and the correspondence of the subject was again very heavy. The disease now appears to have spread over the whole of England, very few spots being left without infection. No further attempt has been made to secure legislative powers to control the disease, but the study of the disease by the Board's expert advisers has been continuous and many experiments have been conducted. In most cases these took the form of supplying correspondents with small quantities of two drugs which it is believed will cure the disease in attacks which have not developed beyond a certain point. The result has been fairly successful on the

whole, but investigations on these lines are unsatisfactory, as it has been found impossible to secure adequate supervision and to prevent the bee-keepers from spoiling the experiment by injudicious action. They often try other cures at the same time, or supply the bees with a double dose of medicine, or neglect their hives in such a way that they fall a prey to other pests. Even in the best circumstances the results are seldom communicated to the Board when a cure is affected. It was, therefore, decided to make an experiment on a new and somewhat extended scale. The test that had been conducted in various centres in the past appeared to justify the opinion that the two drugs which are employed would effect a cure in isolated cases, and it was considered that the time was ripe for ascertaining whether an area of larger size might be dealt with. After some correspondence a village in Buckinghamshire was found, the inhabitants of which were induced by the energy of the chairman of the local association to agree to comply with the Board's requirements and to submit their bees to treatment.

The conditions on which the test was conducted were as follows :—

1. Every colony in the district to be examined by the Board's expert adviser for signs of *Nosema apis*.
2. Every colony declared to be too badly attacked for successful treatment to be destroyed.
3. No other treatment to be applied during the experiment.
4. The bees to be kept under the supervision of a local bee expert.
5. The bees to be finally examined before the experiment is concluded.

The terms were accepted and supplies of the drug sent. Several minor hitches occurred which were perhaps inevitable, and at one time it looked as though the experiment would break down. They were, however, overcome and the work proceeded smoothly. It is as yet too early to say if the result is entirely successful, as the bees must be examined again in 1917, but so far the attempt to keep the disease in check has been attended with fairly satisfactory results. It is reported that while in every village in the neighbourhood for some distance round all the bees have died, in this village where the bees were treated they have thrown off several swarms and given a large supply of honey.

The deadly nature of the disease popularly known as Isle of Wight Disease has naturally led to many attempts on the part of bee-keepers to control or cure the disease, and several specifics have been offered to the public for which remarkable

properties are claimed. As requests are made from time to time to the Board to express a favourable opinion on these treatments, or to conduct experiments with them, it is necessary to lay down the conditions which the Board consider must be fulfilled before a claim to have made a satisfactory cure can be substantiated, either by their own adviser or by any other investigation.

1. In the first place it must be established that the colony is attacked by microsporidiosis, that is to say, the disease of bees caused by the presence of *Nosema apis* in large numbers in the bees' intestines. This can only be done by microscopical examination of specimens from the suspected colony. Naked-eye observations are wholly untrustworthy, as there are no true diagnostic symptoms of the disease, and all the common symptoms popularly associated with the disease may be caused by other influences. The only definition of Isle of Wight Bee Disease that can be accepted is the disease caused by *Nosema apis*, and unless the presence of this protozoon can be established in the colony under observation it is impossible to say with certainty that the bees are attacked by this disease. This preliminary precaution is seldom observed by those who claim to have effected the speedy and remarkable cures to which such prominence is given from time to time in the public press.

2. In the second place the treatment must be applied under conditions which eliminate all possibility of other influences being present. The effect of any treatment cannot be judged except by microscopical examination of the bees and the determination of the presence or absence of *Nosema apis*. No opinion can be given as to the value of any drug or treatment applied to diseased bees if another drug or treatment is applied at the same time, whether the intention is to control Isle of Wight Disease or any other malady to which bees are liable.

3. In the third place, and this is perhaps the most important point of all, no treatment can be considered effective unless the bees remain healthy and free from *Nosema* for a considerable space of time. There is no difficulty whatever in stimulating affected bees in such a way as to throw off all the symptoms popularly associated with Isle of Wight, Disease *i.e.* crawling, inability to fly, dwindling, and even, occasionally, dysentery. Many claims have been made of complete cure of affected bees on the strength of a temporary activity or an apparent improvement in the condition of the colony immediately after treatment. In one case the resumed activity of the bees two hours after having been sprayed externally with a stimulating medium was claimed as evidence of a cure of a disease which, as is well-known, is caused by the presence of vast numbers of a parasite deepseated in and between the cells of the chyle stomach. Such evidence is of course wholly unconvincing, and no claim can be made to success unless the bees remain healthy for several months and survive the following winter, or unless it can be shown that they no longer carry in their bodies any of the parasites associated with Isle of Wight Disease.

Correspondence.—A considerable correspondence was carried on all through the year with numerous fruit growers who sought advice on the management of their trees and bushes and on the pests which were present on them. Correspondence

of this character is seldom satisfactory, as it is practically impossible to give helpful advice without a much fuller knowledge of the facts than the correspondents are willing to give, and only in very few cases can the inquiry be followed up. The scientific officers of the Horticulture Branch are, however, enabled to keep in touch with current problems and to form some estimate of the pests which are prevalent from year to year.

THE NET OUTPUT FROM AGRICULTURE AND ITS DISTRIBUTION.

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IN the *Final Report on the First Census of Production of the United Kingdom*, 1907 (Cd. 6320) the net output per head of persons employed in the industries dealt with in the Census of Production Office is given as £104 for England and Wales. The net output is ascertained by deducting the cost of materials at works from the value of the net output at works. This result constitutes for any industry the fund from which wages, salaries, rent, royalties, rates, taxes, depreciation, advertisement and sales expenses, and all other similar charges have to be defrayed, as well as profits (p. 8).

The same basis of calculation was adopted in the *Report of the Board of Agriculture and Fisheries* on the *Agricultural Output of Great Britain* (Cd. 6277), made in connection with the Census of Production Act, 1906, when the output per person permanently employed in agriculture was ascertained to be £90, counting the farmer in, or £129 if the occupiers were excluded. The accounts of half-a-dozen farms, kept at the Institute for Research in Agricultural Economics, at Oxford, in the year 1914–15 may be cited in general confirmation of this figure, if the rise in prices for agricultural produce since 1906 be allowed for, whilst at the same time they show the distribution of the net output as between landlord, occupier, and labourer. The average net output per man, namely, £169, compares with the higher figure given in the Board's Report, as the occupiers have been excluded from the calculation. The farms concerned are mostly fairly large, and it is probable that the output is higher than the average of the country. The figures vary a good deal from farm to farm, but it is noteworthy that the distribution of the net output as between farmer, labour, and

TABLE I.—*The Distribution of the Net Output from Agriculture*

Farm.	Acreage.	Capital per Acre.	Men per 100 Acres.	Net Output.		Distribution of Net Output.				Distribution of Net Output.		
				Total.	Per Man Employed.	Farmer.	Labour.		Landlord.	Farmer.	Labour.	Landlord.
							Total.	Per Man.				
		£		£	£	£	£	£	£	Per cent.	Per cent.	Per cent.
A ..	1,100	8	2·3	4,266	169	2,111	1,377	55	785	49·4	32·2	18·4
B ..	350	11·5	4·7*	2,900	175	1,292	995	58	613	44·6	34·3	21·1
C ..	189	10	4	1,209	158	565	396	52	248	46·7	32·8	20·5
D ..	550	10	3·6	2.569	129	1,273	698	35	598	49·6	27·2	23·2
E ..	270	23·5	8·5†	3,612	157	1,625	1,078	47	909	45·0	29·8	25·2
F ..	440	9	2	1,671	190	870	382	43	419	52·1	22·9	25·0
Average	483	10·8	3·5	2,704	162	1,286	821	48	595	47·9	29·9	22·2

* Including casual women labour amounting to about 1 per 100 acres the year through.
† Including casual boy and women labour amounting to about 3½ per 100 acres the year through.

landlord, is fairly constant, notwithstanding the fact that the farms are scattered all over England and Scotland, and that many varieties of management are represented. One of them is an intensive potato-growing farm; another is a suburban milk-farm; a third is situated seven miles from the nearest railway station; but in spite of all these and other differences the net results are more or less the same. The fact noted in the Board of Trade Report that a large net output per head is usually associated with high wages is exemplified by farms A and B. On the other hand, the farm D, which is situated in a county where the rates of wages are almost the lowest in England, bears out this statement equally in the low output per man employed. The farm E too, may possibly indicate by its results that the experience of industry that a high net output per head is also associated with heavy capital expenditure will probably be repeated in agriculture, for the output per head is very high if it be borne in mind that nearly 59 per cent. of the labour employed was woman labour.

As regards the distribution of the net output, it must be remembered that only in the case of labour is the whole of the share available as net income. Considerable payments have to be met by the farmer and the landlord out of the shares which they retain, and a recalculation of the figures has been made to show the distribution of what may be termed the *net returns*, as distinct from the *net output*. To do this, all the ordinary expenses except labour and rent have been deducted from the total receipts. Besides these, a figure amounting to $7\frac{1}{2}$ per cent. on the capital invested by the farmer has also been deducted. as representing the interest which capital involved in an enterprise, more or less speculative, might reasonably be expected to earn. Lastly, a deduction has been made to the extent of one-third of the rent, as representing the expenditure upon the holding necessary on the part of the landlord in order to maintain the rent. This is not an arbitrary figure. From an inquiry conducted by the Land Agents' Society in the year 1909, it appeared that about 30 per cent. of the rent received by the landlord is expended by him in repairs, insurance, management, and similar payments necessary to maintain the property in a condition to produce the rent.* The final difference represents the surplus available for the remuneration of manual labour, for the farmer's

* The figure is the average expenditure on 224 estates, extending to some 2,000,000 acres. See *Journal of the Land Agents' Society*, Vol. VIII., 1909, p. 214.

reward as manager, and for the landlord's return on his investment. It would have been far more satisfactory if a further deduction could have been made representing interest on the landlord's capital invested in the holding in the form of equipment. If this could have been done the final figure would have represented only the true rent accruing to the landlord in addition to the reward of farmer and labourer, but the information necessary is not available, nor is there any material upon which to form an estimate likely to be even approximately correct.

TABLE II.—*The Distribution of the Net Returns from Agriculture.*

Net Returns.			Distribution of Net Returns.				Distribution of Net Returns.		
Farm.	Total.	Per Man Employed	Farmer.	Labour.		Landlord.	Farmer.	Labour.	Landlord.
				Total.	Per Man				
	£	£	£	£	£	£	Per cent.	Per cent.	Per cent.
A	3,232	128	1,332	1,377	55	523	41·2	42·6	16·1
B	2,307	140	903	995	58	409	39·2	43·1	17·7
C	949	125	388	396	52	165	40·9	41·7	17·4
D	1,873	95	776	698	35	399	41·4	37·3	21·3
E	2,704	118	1,020	1,078	47	606	37·7	39·9	22·4
F	1,175	134	515	382	43	280	43·6	32·5	23·9
Average	2,040	123	822	821	48	397	40·7	39·5	19·8

The average share of each interest on all the holdings is 19·8 per cent. to the landlord, 40·7 per cent. to the farmer, and 39·5 per cent. to labour. The variations from this average are extraordinarily slight when the differences of locality, soil, size, equipment, capitalisation, wages, objects of management, etc., are remembered. The returns are not sufficiently comprehensive to admit of any generalisation being made for them, and many more records, extending over longer periods, will be required before the various interesting speculations which suggest themselves can safely be followed up.

SOME PROBLEMS IN THE GROWTH OF SILAGE CROPS.

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IN a previous number of this *Journal** the author and Mr. A. W. Oldershaw have shortly sketched the underlying principles upon which silage is now beginning to be produced in East Anglia, so that it will not be necesssry to repeat them here. The present article deals only with oats and tares, and does not touch maize and other crops which are grown for the production of silage. It is based upon observations and investigations made during July of the past summer, when the author visited many growers in Norfolk, weighed several portions of their crops and discussed the various cultural operations given to them.

The objects of the inquiry were mainly directed to the investigation of two sets of problems :—

(1) The conditions under which the most satisfactory crops can be obtained.

(2) The costs of producing such crops.

Table I. has been constructed to show the agricultural practice which each farmer has adopted, and the yields of crop obtained. Table II. is designed to show the costs of growing the crops.

Types of Soil.—In the second column of Tables I. and II. are described the characteristics of the soils, and their rental value, the latter representing the farmer's own estimate of the value of each field and not necessarily the average rental value for the whole farm. These two columns enable the reader to picture the type of land in each case; thus field No. 1, light sand with a rental of 5*s.*, indicates a very poor, thin type of soil characteristic of a large area of land on the western borders of Norfolk and Suffolk, generally known by the name of " breck " land. Fields 2, 3 and 4 are characteristic of much of the sandy soil in the northern part of Norfolk. Fields 5 and 6 are useful mixed soils, capable of growing heavy crops of mangolds. Fields 7, 8, and 9 are heavy soils of boulder clay origin, too stiff for folding, but not excessively heavy.

* July, 1916, p. 333.

In the article previously quoted, the opinion was expressed that there seemed to be two extreme types of soil to which silage crops might be economically extended: namely, light soils in dry districts, where early-sown swedes frequently fail, and where the silage crop might be followed by late-sown turnips; and heavy soils, in which case the silage crop would be followed by a bastard fallow in preparation for wheat. Further, it was stated that upon mixed soils, such as Nos. 5 and 6, favourable to the growth of mangolds, the latter crop would probably be found to be more profitable, especially when used for milk production.

Previous Crop.—In making arrangements for growing a silage crop it is essential to select the correct position in the rotation. If the crop is grown in place of roots, or in conjunction with late-sown roots, for the purpose of enabling the land to be cleaned (and this is generally the practice), it is essential that the crop shall be taken in the position normally occupied by roots in the rotation, that is to say, after a previous white-straw crop, generally wheat. Table I. shows that this plan has been usually adopted, but there are certain notable exceptions: in fields Nos. 2 and 3 the previous crop was potatoes, a tilth which most farmers would allot to wheat, but in this case the farmer selected this position in the rotation for his silage crop, because the oats and tares could be grown at very little expense. When we come to consider the costs of production we must remember to allow something for manurial residues and something for the fact that a clean tilth was used for the silage crop. In field 6 the previous crop was sainfoin, which would also be generally regarded as a wheat tilth, but the land was very full of couch and, being on the University Farm at Cambridge, it was intentionally cropped with oats and tares so that observations could be made on the efficiency of the mixture as a "smother" crop. In field 4, the previous crop had been barley, in which mixed seeds had been sown, but as the latter were a partial failure, tares were pressed into the land and with the thin seeds produced a useful crop.

Date of Seeding.—In all cases except one, the crop was sown in autumn. This is undoubtedly the best practice, because not only do autumn-sown oats and tares generally produce heavier crops, but they are fit to cut earlier in the summer, so that the land can be broken up sooner and allow either a longer period for cleaning the land or greater opportunity of sowing late turnips. If several silos are to be filled

it may be convenient to sow perhaps a quarter of the area with spring-sown crops, so that when the silage has settled after the first filling the later sown crop may be in its prime and be then used for topping up the silo.

Not only is it important to sow the greater part of the crop in autumn instead of spring, but the best results are likely to be obtained by early autumn sowing, so that the plants have time to get established before the winter frost. Probably the best period for sowing the crop would be the last week in September or the first fortnight in October.

Cultivations.—The total manual labour and horse labour used in the preparation and growth of the crop (but not the harvesting) have been added together in the fifth column of Table I. and expressed in terms of man-days and horse-days per acre. It will be seen that in the majority of cases the number of man-days used has been about 2 per acre, and the number of horse-days from 3 to 4 per acre. This amount of labour is required when the land is ploughed before seeding, and naturally increases somewhat with the heaviness of the soil. In fields 2, 3 and 4 much less labour was expended, but here no ploughing was done for the crop, the seed being drilled upon the land after cultivation or harrowing. As previously mentioned, the tares on fields 2 and 3 followed potatoes, after the digging of which the land was left in a friable condition. Case 4 is interesting and suggestive; the barley crop had been sown with mixed seeds, but these had partially failed, and, in order to fill up the crop, tares were heavily pressed in with the drill in October. It is interesting to notice that in spite of the double sowing the labour involved was very small because it was not necessary to plough the land.

In view of this success it is worth considering whether it is necessary to use the plough in preparing the seed-bed—whether the practice of sowing rye-grass in the corn and pressing the tares into the land after harvest can be generally adopted, or whether more economical results might be obtained by using some other implement (as, for example, the disc-harrow or Kentish broadshare) for quickly breaking up the stubble to a depth of 2 or 3 in. after harvest, and sowing the oats and tares in the shallow tilth so obtained. In this way not only would the cost be reduced, but the firm seed-bed so obtained would generally be considered favourable to tares; moreover, by this practice any shed corn from the previous crop would germinate and contribute to the weight of the silage crop.

Seed.—When discussing the seeding it should be noted that tares are required to make the bulk of the crop because, being leguminous plants, they produce a forage which contains a high proportion of albuminoids ; but their stems are so weak that they cannot support their own weight, consequently some other crop has to be introduced for support ; otherwise the crop lodges, gets rotten at the base and is most difficult to cut.

Various crops have been tried as the supporting crop. Rye has a stiff straw and would be suitable for the purpose on light soils, but it suffers from two disadvantages : firstly, it is ready to cut some weeks before the tares are fit, with the result that either the tares must be cut too soon, or, as more commonly happens, the rye is allowed to get too old so that its stems have become fibrous and indigestible ; secondly, the toughened stems of the rye become twisted on the rollers and bearings of the silage-cutter and frequently cause breakages. Wheat would probably answer well enough as a supporting crop if it could establish itself ahead of the tares, but it grows slowly, and whilst it is tillering in spring the tares get up and choke it out. Winter beans produce stout stems, and are admirably adapted for supporting a tare crop, but should be sown deeply or they may be taken by rooks and pigeons. The possibility of putting in a few beans when the land is ploughed is worthy of consideration.

At present much the most common and most useful supporting crop is the winter oat ; in the first place it flowers and ripens at approximately the same period as the tare ; in the second place, oats cut quite early make excellent forage, the stems being soft and digestible and the ears very nutritious ; lastly, oats are not easily suppressed by the tares, possibly because the oat plant is a poor tillerer compared with the wheat plant, and begins to send up its erect stems earlier in the spring. The grey winter oat is generally used as this variety is probably the best for feeding purposes, but it is worth noting that the black winter oat produces a stouter, stronger stem than the grey, and silage growers whose crops get badly laid might be well advised to test the merits of the black winter oat.

Two other plants are worth consideration as supporting crops, namely, Italian rye-grass and rape. The former, more by accident than design, was used in case 4, and though the crop was a comparatively heavy one, the rye-grass kept the

tares off the surface of the ground and enabled the cutting to be done moderately well. It has the further merit of being produced from inexpensive seed; but, on the other hand, it ripens early, and when over-ripe sheds its seeds which in due course may become troublesome as weeds in the succeeding crops. Rape is grown to some extent as a supporting crop in the south-west of England for folding and soiling purposes. It has not yet been tried in England for silage, but American reports suggest that cruciferous crops do not generally produce good silage.

If the crop be sown early in autumn, the rate of seeding need not be unnecessarily high. The truth of this contention is well illustrated in fields 2 and 3, where a seeding of only 8 pecks produced a crop of 2·4 tons of dry material upon light sandy soil, in spite of some damage by hares, while in fields 5 and 8 heavy seedings of 14 pecks per acre produced only 2·3 and 2·6 tons of dry material respectively, though sown on better land. As regards the relative proportion of tares to cereals, it is generally agreed that tares should form the major part of the crop. Probably a seeding of 5 to 6 pecks of tares with 4 to 5 pecks of oats is best in most cases. This will usually secure a maximum crop, and at the same time be a sufficient seeding to suppress weeds. This seeding at pre-war prices would cost 14*s.* to 15*s.* per acre.

Manures.—Since the tare is the more important part of the silage, nitrogenous manures do not as a rule need to be applied, but it is important to give the crop an adequate supply of mineral manures. The soil should contain some lime, and phosphatic manures—superphosphate slag or bone flour—should in most cases be supplied, especially when the crop is grown upon heavy land. In addition, small quantities of potash should be applied to any light soils which are known to be deficient in this constituent. Where the fertility of the soil is very low, some expenditure upon a quick-acting nitrogenous manure for the oat crop will probably be repaid.

Table II. shows the cost of the manures used, charged at pre-war prices, and where no manures were used an estimate of the residual value of the manures from the previous crop has been made. This residual value is not easy to calculate; it has been assumed that it is worth 30*s.* per acre in cases 2, 3 and 6, which can justly be considered as wheat tilths, and at 5*s.* per acre in case 4, when the crop follows barley without extra manure.

The Yield.—Columns 8 and 9 in Table I. show the weight of crop grown. These weights were obtained by weighing the crop from 5 or 6 plots half a rod square in each field, the figures in column 8 representing the means of such weighings. Samples were taken from each plot, and their dry weights were determined; it was found that the weights of dry material varied considerably, for whereas the crop from field 1 contained as much as 30 per cent. of dry material, that from field 8, cut soon after rain, contained less than 15 per cent. of dry material. It is clear that the weight of green crop gives no accurate guide to the production of the field, and consequently the weight of dry material alone has been considered in discussing results. The production varies from 1·4 tons per acre on very poor ground (field 1) to 3·6 tons per acre on field 6, this latter being a splendid crop of oats and tares, and probably near the maximum of production. If we exclude these two extremes, it is seen that the remaining crops approximate very closely to the average crop of the whole series, namely, 2·34 tons per acre of dry material.

Suppression of Weeds.—The economical success or failure of the oat and tare crop for silage purposes very largely depends upon the extent to which it enables the farmer to fight against weeds, consequently this feature has been very carefully studied by the author during the past two sessions, both as regards the condition of the oat and tare stubble and the freedom from weeds of the subsequent crops. It may be generally stated that if the crop is heavy and becomes lodged, as was the case in fields 5, 7, 8 and 9, then the weeds are almost entirely suppressed. In field 8 this suppression of weeds was remarkably perfect; there was scarcely a weed of any description to be seen at the time of cutting, so completely had the tare crop dominated not only the weeds but the oats as well. In these cases, however, suppression was too vigorous, and the crops were partly rotten and very difficult to cut. In fields 4 and 6, where good standing crops were grown, weeds were also well suppressed. Only in fields 2 and 3 had the weeds been able to make any headway, and in these cases the reasons seemed to be too thin a seeding and serious thinning of the crop in places by hares, thus enabling the weeds to get access to light and air.

In most cases it has not been possible to follow closely the subsequent history of the weeds after the crops were cut, but fields 6 and 9 are on the University Farm at Cambridge, and these have been very carefully studied. In these two cases

the crop was not made into silage, but into hay, which was cleared from the field some 3 or 4 weeks after cutting. In field 6 no cultivations were done, but the crop was left to make a second growth; this was poor and thin and exerted little check upon the weeds, which were already growing vigorously six weeks after the oat and tare crop was cut. It is therefore clear that the oat and tare crop does not exterminate perennial weeds, but only suppresses them temporarily. In field 9, the oat and tare crop was cut on 20th June, but owing to bad weather could not be cleared until 26th July, by which time quite a quantity of weed growth (couch and docks) were showing. The field was ploughed on 7th August and cultivated with the Larkworthy's broadshare on 13th September, ploughed a second time on 30th September and cropped with wheat on 20th October. The weather during late summer was characterised by frequent showers, and was consequently not very favourable to cleaning, yet the above-mentioned cultivations combined with the smothering effect of the silage crop were sufficient to produce a clean seed-bed. This result has been confirmed by the experience of silage growers, and inspection of several wheat fields after silage grown in 1915 has shown remarkably clean crops.

The silage crop, provided the ground is broken up directly after the crop is removed, undoubtedly provides exceptional opportunities for cleaning land, and for the following reasons:—

(1) The weeds are weak owing to the smothering effect of the silage crop.

(2) The ground is dry because the crop has exhausted the soil moisture, consequently the weeds dry out quickly after ploughing.

(3) The weather is generally hot and dry; this also facilitates the drying up of the weeds.

(4) Before the corn harvest the pressure of farm work is generally not very severe, so that horse or steam labour is available for the work.

Costs of Production.—Table II. shows in detail the costs of producing the green forage under the conditions described in Table I. Some of these figures have already been discussed. Column 2 represents a full year's rent, but no charge has been made for rates, since the silage crop is removed in early July, and the rental value of the land from July to Michaelmas may be taken as being equal in value to the rates and charged

TABLE I.

1 Field No.	2 Type of Soil.	3 Previous Crop.	4 Date of Seeding.	5 Cultivations. Man-days.	5 Cultivations. Horse-days.	6 Seed, in Pecks. Tares.	6 Seed, in Pecks. Cereals, etc.	7 Manures.	Cwt.	8 Weight of Green Crop per Acre.	9 Weight of Dry Crop per Acre.
										Tons.	Tons.
1	Light Sand	Oats	Jan. 25..	1·8	3·9	8	8	Bone Flour	3	4·6	1·4
2	Sand ..	Potatoes	Oct. 7..	·4	·8	3	5	Residues		9·7	1·9
3	,, ..	,, ...	,, 7..	·4	·8	3	5	,, ...		10·7	2·4
4	,, ..	Barley	,, 14..	·8	1·2	4	*x*	,, ...		15·6	2·5
5	Loam ..	Wheat	,, 18..	1·7	3·0	6	8	Slag ..	4	15·8	2·3
6	,, ..	Sainfoin	,, 20..	2·4	4·3	6	6	Residues		15·3	3·6
7	Clay Loam	Wheat	Sept. 25..	1·7	3·2	8	2	Super ..	4	12·4	2·1
8	Clay ..	,, ...	Oct. 10..	1·9	3·9	10	4	Slag ..	5	18·6	2·6
9	,, ..	Barley	Nov. 2..	2·7	5·0	6	6	,, ..	5	12·5	2·3
	Average ..	—	—	1·5	2·9	6·0	4·5	—		12·8	2·31

x = 16 lb. of mixture of rye-grass, white clover, alsike, trefoil.

TABLE II.—*Costs at pre-war prices.*

	Rent.	Previous Crop.	Cultivations.	Seed.	Manures.	Cost per acre.	Cost per ton Dry Material.
	s. d.		*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
1	5 0	Oats	14 4	23 0	12 0	54 4	38 10
2	15 0	Potatoes	3 0	10 0	30 0	58 0	30 0
3	20 0	,, ...	3 0	10 0	30 0	63 0	26 3
4	20 0	Barley	5 0	20 0	5 0	50 0	20 0
5	22 6	Wheat	11 9	19 0	12 0	65 3	28 4
6	25 0	Sainfoin	16 9	16 6	30 0	88 3	24 6
7	20 0	Wheat	12 3	17 6	12 0	61 9	29 5
8	20 0	,, ...	14 4	25 0	15 0	74 4	28 7
9	20 0	Barley	19 3	16 6	15 0	70 9	30 9
Average	18 6	—	11 1	17 6	17 11	65 0	28 6

to the subsequent crop. The cost of cultivations in column 3 have been obtained by charging each man-day and each horse-day at 2*s*. 6*d*. The charges for seed and manures have also been calculated upon pre-war prices. Column 8 shows that the costs per acre of producing a crop of tares varies from 50*s*. in field 4 to 88*s*. 3*d*. in field 6, and that the average cost on all fields is 65*s*. It will be noticed that the low costs of cultivation and of seed in fields 2 and 3, where the crops followed potatoes, have been negatived by the high figure taken as the value of the manurial residue from the preceding crop. The low cost of the crop upon field 4 is due to low costs of cultivation, the tares having been pressed into the land with no previous ploughing.

The last column in Table II. gives the cost of producing one ton of dry material, and this is the most important column in the Table. It will be noticed that the lowest cost per ton is that of field 4 (20*s*. per ton); the factors contributing to this result were low cost of cultivation, low estimate of residual manure used, and a good crop. The next best field is No. 6, in which a ton of dry forage costs 24*s*. 6*d*.; in this case the good result is due to an exceptionally heavy crop, the costs per acre being higher than for any other field. Lastly, field No. 1 was the most disappointing; the cost was 38*s*. 10*d*. per ton, and this poor result was due in a great measure to the small size of the crop produced, which, in its turn, was the result of a poor soil and of a late seeding.

No experimental evidence has yet been obtained upon the losses suffered during the storage of oat and tare silage, nor upon the feeding value of the same. It is hoped that this evidence may be collected during the coming season.

THE MANUFACTURE OF CHEESE IN CO-OPERATIVE DAIRIES.

SHORTLY after the outbreak of War, the Board issued a Special Leaflet (No. 41) advising milk producers to convert their surplus milk into cheese; to manufacture cheese instead of butter; and, by the exercise of greater economy in calf-rearing, to increase the amount of milk available for cheese production.

In 1915, County Education Authorities throughout England and Wales were asked by the Board to encourage the manufacture of cheese in all districts where the supply of milk was in excess of what was required for human consumption. As a result 19 counties took action under the scheme suggested by the Board, and between them 33 new cheese-making schools were established and a large number of teachers were employed.

The effect of these cheese schools, coupled with the home visits paid by the instructresses, has been to arouse very considerable interest in cheese-making, and has already gone far towards establishing the industry in many areas where cheese has hitherto not been made.

The advancement of the industry has also been assisted by the comparatively high prices at which cheese has been selling.

Principal Uses of Milk.

During the period of food stress occasioned by the War, there are three ways in which our milk supply ought mainly to be used. These are :—

(1) For direct human consumption.
(2) For the rearing of calves, and
(3) For cheese-making.

Almost all other purposes for which milk is used are, in the present circumstances, wasteful.

Of the three uses above mentioned, the first is the most important, and all legitimate demands in this connection should be satisfied before the other purposes receive consideration.

It is necessary, however, that very great care should be taken by householders to make the fullest use of all supplies purchased by them ; that the milk whilst in their charge should be properly cared for, so that all loss of food material may be avoided ; and that the quantity purchased should be strictly limited to the minimum requirement.

Similarly, suppliers of milk should take all such precautions as will prevent the waste of any surplus that they may have over and above what is necessary to supply their trade.

With regard to calf-rearing, substitutes for milk should be employed entirely from the age of six weeks onwards. To feed milk in any form to calves beyond that age, is undoubtedly an economic waste of human food.

If all these precautions were adopted a much greater supply of milk than is at present available would be at the disposal of the cheese-maker.

Importance of Cheese-Making

The Board advocate the manufacture of cheese for two reasons :—

(1) Because the manufacture of cheese is the best way of conserving milk as a food. It retains the casein—the most valuable food constituent of the milk—which is not the case when butter is made. The product can be stored for a considerable length of time and is less perishable than most other forms of dairy produce. The by-product, whey, is an exceedingly useful pig food, and may to some extent be used for the rearing of calves.

(2) Because, though cheese-making is an industry particularly to be encouraged during the War, it is also one which will be of considerable advantage after the War to those who adopt it. Great Britain is far from being self-supporting in the matter of cheese supply, and for many years cheese has been largely imported.

A few decades back the over-seas supplies were plentiful, but these supplies in relation to the country's requirements have for some time past been declining, and the indications are that as time goes on this country will have to depend more and more on her own production of cheese.

There is every prospect, therefore, that the industry is now on a firmer foundation, both with regard to the present and the future, than it has ever been before.

A further advantage of the cheese-making industry to the country lies in the fact that cheese is made at a seasonable time, usually when milk can be produced at the lowest cost, *i.e.* when the cows are on grass.

A cheese-making farmer usually arranges for his cows to calve down in March or April, which means that he can feed his stock during the winter almost entirely on home-produced feeding stuffs.

Co-operation in Cheese-Making.

As a result of the educational campaign, which was particularly in evidence last season, the above facts are becoming more clearly recognised, and very many dairy farmers who are not suitably situated for the sale of whole milk are now either starting, or are desirous of starting, the manufacture of cheese.

The movement is being checked, however, in some districts, by the fact that the home dairies do not provide adequate

accommodation for cheese-making. This is more particularly the case in those districts where the manufacture of cheese may be regarded as a new industry; and also because the establishment of a cheese-making dairy involves a certain outlay in special apparatus. In such cases as these the obvious solution is co-operation.

Several co-operative cheese factories are already in existence, and some of them were established long ago. Many instances of success might be cited as well as some cases of failure. In regard to the latter, it is fair to state that the great proportion of failures which have occurred have been in consequence of indifferent management or of the want of loyalty on the part of the members.

To secure success in any form of co-operation three things are necessary: it is essential that there should be genuine interest, true loyalty, and efficient management. Where these three circumstances exist, co-operation in cheese-making is one of the easiest forms of joint effort to establish.

Advantages of Co-operating.

The chief advantages to be gained by dairy farmers joining together for the purpose of converting their milk into cheese are:—

(1) The cost of manufacture is less.
(2) There is greater uniformity in the quality of cheese made.
(3) The losses from waste are reduced.
(4) A greater range of market becomes available.
(5) There is less inconvenience and untidiness in the farmer's home.
(6) A small producer of milk receives the same benefits as the larger farmer.
(7) It obviates the necessity of modifying the home dairy and the purchase of apparatus.
(8) It reduces labour.
(9) By joining together, dairy farmers can afford to engage the services of a really skilled cheese-maker, and thereby ensure the production of a high grade cheese.

These are all matters of great importance.

Modern conditions in dairying, combined with the shortage of labour, are circumstances which are gradually forcing farmers to co-operate.

In districts where cheese-making is being taken up for the first time the establishment of the industry on a co-operative basis is most desirable.

Before a co-operative factory can be started it is necessary to have a guarantee of a supply of a sufficient quantity of milk, and to secure enough capital with which to establish and equip a dairy or factory.

In regard to the quantity of milk which is necessary, it is hardly possible to make an exact estimate. The amount may be from 200 gal. daily, upwards.

It is clear, however, that the greater the quantity, the less is the proportionate cost per gallon of the working expenses. When only 200 gal. per day are supplied, the expenses are rather heavy, and the difficulty of paying for expert management is proportionately increased. Such small quantities can, however, be managed with success, but the ideal quantity is a minimum average daily supply of 1,000 gal. throughout the cheese-making season—April to October.

The amount of capital required varies considerably with the local conditions and also with the magnitude of the undertaking. If there is a building in existence which can readily be adapted the expense is not great, and the raising of capital should present no difficulty. The procedure adopted to obtain the capital is also capable of variation, but probably the most satisfactory method is for each member to be required to hold shares in proportion to the number of cows whose milk he intends shall be delivered at the co-operative centre.

In order to demonstrate further the possibilities of co-operation in this country, several county authorities have, at the suggestion of the Board, recently established co-operative cheese schools.

The most difficult part of setting up a satisfactory system of co-operative dairying lies in the initial steps; for unless these are taken in the proper order, and in accordance with the most approved business methods, the result will not be all that might be desired. For this reason the Board have prepared and are about to print a complete scheme of procedure for the establishment of co-operative cheese factories. A copy of this scheme may be obtained gratis and post free on application to the Board. (Pamphlet A303/I should be asked for.)

SKIM MILK CHEESE.

THE utilisation of skim or separated milk for the manufacture of cheese has in the past been confined to a few districts where butter-making has been largely practised. In other areas where there was a plentiful supply, a small proportion has been used for the manufacture of casein, but the bulk has been used on the farms for the feeding of calves and pigs.

Because skim and separated milk has been so largely fed to stock, and has been valued at a price much below that of new milk, a wrong impression has been received as to its value as a human food. In many instances the value of separated milk has been placed at from one-sixth to one-eighth of that of whole milk, but nevertheless, more than two-thirds of the nutritious dry-matter originally in the whole milk is contained in the separated milk; in other words, of the fat, albuminoids and sugar in the whole milk, only the fat is taken off in the cream, and the albuminoids and sugar remain in the separated and skim milk.

At the present time it is of vital national importance that every effort be made to increase the supply of human food, and therefore skim and separated milk, either as milk or in the form of cheese, should be utilised for this purpose to the largest possible extent. The gain in the form of human food from turning skim and separated milk into cheese, rather than feeding it to pigs, should be quite clear when it is stated that 4 gal. of separated milk will make 3 lb. of cheese, whereas the same quantity fed to pigs will produce 1 lb. pork (and that at a more distant date and after the utilisation of other expensive foods). If it is the custom to feed the separated milk to calves, it should be noted (1) that calves can be reared quite satisfactorily from the age of 6 to 8 weeks on materials which are of no use as human foods, and (2) that it is desirable to rear a smaller number of calves than usual during the present season.

On many farms and in private dairies, where butter is made for home use, the amount of skim and separated milk available is such that an appreciable amount of cheese could be made in the course of the season. The cheese could be used at home or sold locally, and if reasonable care is exercised in the management of the milk and in the process of making the cheese, a thoroughly satisfactory and most nutritious article of food should be produced. The method of manufacture described below has been worked out by Mr. A. Todd, of the British

Dairy Institute, Reading; a large number of excellent skim milk cheeses have been made at Reading in February and March of this year, and the system can be confidently recommended.

Buildings and Utensils.—A dairy used for butter-making may be readily adapted for cheese-making, or almost any clean, airy, sheltered building may be used. If a fair quantity of cheese is to be made, then another room will be required for ripening and storage purposes; this room (or a clean cellar) should be fitted with shelves round the walls. Both rooms should be freely ventilated, and all windows and ventilators should be made to open and close as desired, so that the temperature of the rooms can be controlled.

The utensils required will depend on the amount of milk to be dealt with and the kind of cheese to be made. Where only small quantities of milk are available, there will be required one or two tubs of a capacity of 6 gal. each, with wooden racks made to fit inside the tubs, cheese moulds and followers such as those used for the manufacture of Caerphilly or Small Holder* cheese, a milk strainer, a large knife for cutting the curd (a carving knife will do), a skimmer, a measuring glass, a thermometer, rennet extract, cheese cloths, and weights up to 28 lbs. for pressing the cheese. Where larger quantities of milk are available, larger tubs should be used, but the curd obtained should be made up in cheese not exceeding 10 lb. weight; the moulds and followers used for the manufacture of truckle Cheddars are quite suitable for this size of cheese, and in addition, a properly constructed cheese press will be necessary. Generally speaking, the equipment for Caerphilly or Small Holder cheese will be most useful for the manufacture of skim milk cheese.

The Milk.—It is essential that the milk intended for cheese-making should be perfectly clean and in good condition. Milk which contains much sediment, or has become in any way contaminated, cannot be made into good cheese.

Skim milk, *i.e.* the milk left when the cream is removed by hand-skimming, usually contains from ·5 to 1 per cent. of fat, and separated milk, *i.e.* the milk obtained when the cream is removed by a separator, contains from ·1 to ·3 per cent. of fat. While it is possible to make cheese from separated milk, or from skim milk containing less than 1 per cent. of fat, this

* Some firms of dairy utensil manufacturers supply moulds and followers in complete sets specially designed for this type of cheese, and equally suitable for skim milk cheese.

is not to be recommended; the resulting cheese will be hard and leathery, and, though nutritious, will be very unappetising. Much better results will be obtained by using skim milk containing at least 1 per cent. of fat, or separated milk which has sufficient whole milk added to it to raise the fat content to between 1 and 1·5 per cent. Skim milk of the desired quality can easily be obtained by less thorough skimming. Where a separator is employed 1 gal. new milk added to 4 gal. separated milk will give a mixture of the desired fat percentage in the case of Jersey and Guernsey herds; with Shorthorns, Devons, etc., a slightly larger proportion of new milk should be used.

A very slight increase in the percentage of fat in the milk has a notable effect in improving the palatability of the cheese. Where both butter and cheese are made, the small quantity of new milk added to the separated milk will reduce slightly the yield of butter, but this will be more than recompensed by the improved quality of the cheese.

Cheese made from milk of the above quality will be ready for eating in from 3 to 5 weeks from the date of manufacture, and will keep in good condition for 8 to 10 weeks; afterwards it becomes rather hard and dry. If it is desired to make a quantity of cheese which will keep in first-class condition for six months or longer, whole milk with about 3 per cent. of fat should be used, and the method of manufacture modified to that usually adopted for truckle Cheddars.

Method of Manufacture.—*Preparation for Rennetting.*—Five gal. of milk will make a cheese of convenient size; larger quantities may be used if there are sufficient utensils and accommodation for storage. Before the rennet is added it is desirable that the milk should have developed a certain amount of acidity.* Where skim milk is used the period of setting the milk for cream-raising will usually have sufficed for this purpose, and the milk should be thoroughly stirred in the tub and raised to a temperature of 82° F. Where separated milk is used it will be desirable to have 2 to 4 gal. kept from the previous evening in order to give time for the acidity to develop; the requisite additional quantity of separated milk and the 1 gal. of new milk can then be added in the morning, the whole thoroughly mixed and the temperature raised to 82° F. Too much acidity is undesirable or the cheese will become hard and brittle. Rennet should be added at the rate of 1 dram to 3 gal. of milk, or enough to coagulate the milk to a condition

* See footnote on page 178.

suitable for cutting in 35 minutes. The correct quantity of rennet extract should be diluted with six times its bulk of water, and then thoroughly mixed with the milk; after careful stirring for from 2 to 3 minutes the tub should be covered with a cloth and the milk left untouched till firm enough for cutting.

Cutting the Curd.—The curd should be cut when it splits with a clean fracture before a thermometer or finger drawn through it. The cutting can be done by specially-made American curd knives, but a long-bladed knife for the up-and-down cuts, and a skimmer for the horizontal cuts will do quite well; the cutting should be continued carefully until the curd is reduced to pieces about half an inch square; cutting to smaller cubes is undesirable. After cutting, the curd is gently stirred by hand to allow the whey to separate, then it is allowed to settle to the bottom of the tub for 15 minutes.

Cooking the Curd.—The curd is next stirred up gently, and the stirring continued while the temperature is gradually raised to 86° F. The usual method of bringing about this rise in temperature is to place a cheese-cloth over the tub and pressed down into the whey so that a quantity rises inside the cloth; some of this whey (4 to 5 qt.) is ladled off into a pail and its temperature is raised, by the immersion of the pail in hot water, to such a degree that when it is poured back into the cheese tub the whole of the contents may have a temperature of 86° F.

When this temperature is reached the curd is allowed to settle to the bottom of the tub for another 30 minutes; at the end of this time it should be fairly firm, bright in appearance, sink readily to the bottom, and on pressing a little in the hand the particles should cohere and be a little springy. If these conditions are met, the whey should be poured off* through a straining cloth and the curd collected, tied up in a bundle in a cheese cloth and replaced on the rack in the tub for 20 minutes. At the end of this period the particles of curd should have matted into a solid mass, and this should be cut into blocks 4 in. square and tied up again for a similar period. This cutting and retying in the cheese-cloth should be repeated for other two or three times, or until the curd has matured and dried to a more flaky condition,* the time required being about 1½ hours from the removal of the whey.

* Should the apparatus and chemicals be at hand for determining acidity by the acidimeter, the process of manufacture should be regulated as follows :—Acidity of milk at rennetting—not exceeding ·19 per cent.; acidity of whey when removed from curd—·12 per cent.; acidity of whey at salting—·18 to ·20 per cent.

Salting and Moulding.—The curd is now weighed, broken up by hand into small fragments, and salt added at the rate of 1 oz. to 3 lb. of curd. The salt must be thoroughly stirred in and the curd is then ready for filling into the cheese mould.

The mould is lined with a cheese-cloth of suitable size and the curd filled in rapidly and evenly by hand. When filling is completed the edges of the cloth are turned over the curd, the wooden follower is placed on top, and pressure applied at once by means of a 14-lb. weight. In 2 hours time the cheese is removed from the mould, turned and replaced, and pressure applied to the extent of 28 lb. It is left in this condition overnight. Next morning the cheese is taken out of the mould, the cheese-cloth removed, the edges trimmed and a bandage of clean calico sewn round the cheese. It is then returned to the mould and the 28-lb. weight replaced for two hours ; after this period has elapsed the cheese is finally removed from the mould, placed on a table or shelf in the making-room to dry somewhat and is turned daily. After 2 or 3 days it should be removed to a shelf in the ripening-room and turned daily ; in 3 to 5 weeks it is ready for use.

Suggestions for Cropping in 1917, with Special Reference to Difficulties Arising out of the Severe Winter and Late Spring.

THE Technical Committee of the Food Production Department of the Board have had under their consideration cases of possible difficulty which may be encountered by farmers in arranging their cropping this year. The recommendations made by the Committee for meeting these difficulties are given below :—

1. **Partial Failure of Autumn-sown Crops.**—(*a*) *Wheat and Oats.*—The common plan of harrowing a thin plant of winter wheat or oats to promote tillering may in some cases be inadvisable this year owing to frost having lifted the plants so much that harrowing would completely uproot a large proportion. If the crop is so thin as to hold out no hope of a satisfactory result, a spring corn crop may be sown in it. Mixed grain is not as a rule saleable or useful except for stock feeding, and spring wheat and oats should be selected for filling up winter wheat and oats respectively, but in case of wheat care must be taken to select an early ripening variety, such as April Bearded or Red Fife. Even with these, sowing should be completed by the middle

of April. Failing suitable varieties of spring wheat, barley should be selected in preference to oats for filling up a thin wheat plant, as an oat and wheat mixture is not suitable for milling.

(*b*) *Beans.*—In the South of England it is a common custom when beans are sown on rather light land to drill white turnips about the beginning of June in rows alternating with those of the beans. After the beans have been harvested the horse-hoe is set to work to cultivate between the rows of turnips. They are not thinned, and produce very useful winter food for sheep. Rape sown broadcast at the rate of 4 or 5 lb. an acre is sometimes substituted for the turnips.

2. **Inability to Sow Spring Corn Crops at the Usual Time.**—In the case of oats there are early ripening varieties, such as Yielder, Black Tartarian, Tartar King, Golden Rain, which may be sown comparatively late with fair prospects of success, and any of the barleys, except Archer's Stiff Straw, may be put in up to mid-May, but after this one of the following crops is to be preferred :—

(*a*) *Linseed.*—This is best suited to medium or rather heavy soils and does well after old grass. Seed should be sown at the rate of 80 to 100 lb. per acre not later than the end of May. Special care must be taken in securing good seed. "Plate" linseed appears to be the most suitable for seed production, but if commercial Plate seed is used care would have to be taken to see that it is clean and of good germination. If any difficulty is experienced in obtaining seed locally, reference should be made to the British Flax and Hemp Growers Association, 14 Victoria Street, London, S.W. 1. Full particulars of the cultivation of the crop are given in the Board's Leaflet No. 278, and in the *Journal of the Board of Agriculture* for February, 1916.

(*b*) *Buckwheat* is grown largely on fen soils, but it also has the advantage of thriving on the poorest sandy soils and may be sown in late May or early June. If drilled, about 40 lb. of seed is required per acre ; if sown broadcast, 2–2½ bush. per acre should be used. On the poor soils, for which it is best suited, a yield of 3 or 4 quarters of seed may be expected. Buckwheat flour may be used to mix with wheat flour for bread-making, and the whole grain is a useful food for pigs, chickens and poultry generally. An article on the cultivation of Buckwheat appeared in the *Journal of the Board of Agriculture for* February, 1916.

(*c*) *Oats and Vetches or Oats and Peas*, if sown before the end of May, will give a very useful forage crop either for use in late summer as green food or for making into hay or silage. If the soil is not in good condition 1 cwt. or so of sulphate of ammonia per acre should be given either before sowing or as a top dressing. A suitable quantity of seed would be about 3 bush. of oats and 1 bush. of vetches or peas per acre.

(*d*) *Maize.*—In the Eastern, South-Eastern and Southern districts of England maize is a most useful forage crop, particularly for dairy farmers who require a supply of succulent food when the pastures fail in autumn. As a rule, thorough cultivation and liberal manuring of the ground are considered essential, but, as sowing may be made until fairly late in June, it would be possible to sow the crop with prospects of fair results in a good many of the cases under consideration. The chief difficulty likely to be experienced is the persistence of attacks by rooks, pheasants and other birds. The best method of prevention is that of " stringing " the field as soon as the seed has been sown. (Full particulars of the cultivation of the crop are given in the Board's Leaflet No. 73.)

(*e*) *Swedes, Turnips or Rape* sown in May or June would be available for use in autumn, and the two latter could be cleared sufficiently early for the sowing of winter wheat or oats.

(*f*) *Mustard* sown in July or August would give useful sheep feed in September and October and make a good preparation for wheat.

(*g*) *Bare Fallow.*—In cases of exceptional difficulty, and as a last resort, attention may be concentrated on the crop for 1918, the land being worked as a bare fallow with a view to sowing wheat early in autumn.

3. **Failure of a Spring-sown Corn Crop owing to Attacks of Wireworm.**—In most cases the full damage is not evident until about the end of May, and as maize is also susceptible to attack by wireworm the best plan would be to sow white turnips, rape or mustard, which are comparatively immune.

4. **Reluctance to Sow Mangolds, Swedes, or Turnips in the ordinary way owing to anticipated Lack of Labour for Singling and Weeding.**—This ought not to be a common difficulty, as labour of the kind described can be performed quite well by women and children. In extreme cases Kale (Marrow Stem or Thousand Head), Rape or White Turnips, sown either broadcast or in rows, may be substituted. Maize is another good substitute, and oats with vetches or peas may also be grown and made into hay or silage if not required for use as green fodder.

5. **Shortage of Cabbage Plants owing to Damage by severe Frosts or Wood Pigeons.**—This may be remedied by making spring sowings of suitable varieties, and in view of the shortage of labour farmers are advised, where possible, to sow at least part of their cabbages direct in rows and to thin out afterwards rather than to transplant in the ordinary way. The only disadvantage of this system is that more seed is required than when it is sown in a seed bed, but this difficulty can, if desired, be avoided by mixing the cabbage seed with some white turnip seed. In all probability 1 lb. of cabbage seed per acre will give as many plants as are required, and the turnips, which are easily distinguishable, can be struck out when singling is done. In the event of the cabbages failing owing to attacks by "fly" or other causes, it is possible that a sufficient number of the turnips would be left to produce a crop for early autumn use.

The advantages of drilling cabbages as compared with transplanting are: (*a*) a great saving of labour; (*b*) a great reduction in the risk of loss through drought. Care must be taken to select a suitable variety.

Giant Drumhead, drilled in April, will come in for use in					November—March.
Early Drumhead	,,	,,	,,	,,	September—November.
Sheepfold	,,	,,	,,	,,	September—November.
Early Market	,,	April and May		,,	September and October.

The Drumhead Varieties, either Late or Early, give the heaviest crops, and the only advantage of the Sheepfold and Early Market type is that they are ready a little earlier and are easily marketed if not required for stock feeding.

In view of the great demand likely to be experienced for cabbage plants, not only from farmers but from allotment holders and cottagers, it is recommended that seed beds be laid down in school gardens in suitable districts. In the interest of the national food supply it is desirable that an extended area of cabbages should be grown this year.

I. **Introduction.**—The improvement of much of the upland grazing in Wales and in many of the English counties may be effected by the formation of rape-pastures.

Rape Pastures. These pastures are established by ploughing down the old turf, and without resort to a summer fallow or any preliminary cropping, preparing a tilth and sowing down a seeds mixture under rape.

The recommendations made are based on the results obtained in trials conducted in Mid-Wales by the Agricultural Department of the University College of Wales, Aberystwyth, particulars of which are given below (p. 185).

II. **Conditions Necessary for Success.**—The direct formation of a rape pasture can be successfully undertaken when the following conditions are fulfilled :—

(1) The rainfall must be high, say over 30 in. per annum.

(2) The soil must be of a loose and friable nature so that a good tilth can be easily and quickly obtained.

(3) It must have been possible completely to bury the turf.

(4) The turf should be comparatively free from gorse or bracken.

(5) The land must be ready for sowing by the end of June at the latest.

(6) There should be a reasonable chance of obtaining a clean seed-bed without resort to extensive tillage operations.

(7) The fences must be in good order so that the grazing may be regulated.

III. **Practical Recommendations.**—In forming a rape pasture the following practical details should receive careful attention :—

(*a*) *Breaking up and Sowing.*—The furrows should be turned over flat ; a broad, flat furrow should be aimed at rather than a narrow, tilted one. The " one-way " plough is probably the most suitable implement for the hilly ground under consideration.

In order to obtain the best results lime and basic slag should be applied. Lime need not, however, be regarded as invariably essential, but basic slag (6–10 cwt. per acre) should always be used. It must be remembered that basic slag will not only encourage the clovers and, therefore, react on the fertility of the land when the ley or pasture is subsequently broken up, but will also ensure a good yield being obtained from the rape and turnips.

The lime (if used) and basic slag may be applied and harrowed in at any convenient time after the land has been ploughed.

The best method of sowing the seed on clean land would be as follows :—

Harrow as frequently as is necessary to obtain a satisfactory tilth and sow the rape, turnips, rye-grass, red clover and chicory ; then harrow with a light chain or brush harrow, sow the small seeds and roll.

(*b*) *Seeds Mixtures.*—Reliable seed and adequate seeds mixtures must be employed. The nature of the actual mixture used will be dependent to some extent upon the prospects of obtaining a good sward. If a good tilth can be assured, and if lime and basic slag have been applied, it would be wise to sow a good, even if expensive, mixture. If, on the other hand, only a moderate tilth can be expected and the prospects of obtaining a lasting sward (*e.g.* for four years and upwards) are but slight, a cheaper mixture would he more suitable.

A suitable comparatively cheap mixture would be as follows :—

	Per acre.
Perennial Rye-grass	16 lb.
Cocksfoot	6 ,,
Timothy	4 ,,
Broad Red Clover	4 ,,
Wild White Clover	1½–2 ,,

A better and more expensive mixture, which should only be used when there is every prospect of obtaining a sward which will "hold" for four to six years, would be—

	Per acre.
Perennial Rye-grass	12–14 lb.
Cocksfoot	6–8 ,,
Timothy	4 ,,
Crested Dog's Tail	1 ,,
Broad Red Clover	2 ,,
Late-flowering Red Clover	2 ,,
Alsike Clover	2 ,,
Wild White Clover	1½–2 ,,
Chicory	2–3 ,,

On poor fields it would be an economy to substitute 1 lb. of wild birds' foot trefoil (harvested in England) for a part of the wild white clover. The inclusion of late-flowering red clover, or even broad red clover, will add materially to the value of the grazing during the first autumn and the subsequent spring and summer.

Chicory has proved itself to be very satisfactory in the trials in Wales, and has given a substantial amount of keep during the first autumn. At present prices, however, it should only be sown when the conditions are very favourable.

Rape and turnips mixed have shown themselves to be the most reliable nurse crop. The quantity of seed sown should not exceed 3 lb. per acre.

Rape or a mixture of rape and turnips also makes an admirable "nurse" crop in the case of fields that have been through the rotation. It is to be especially recommended in

the case of fields that are to be put down for a period of years and from which several corn crops have been previously taken.

(*c*) *Subsequent Treatment.*—The herbage must be carefully grazed the first autumn, care being taken not to allow the grasses and clovers to become "winter proud"; at the same time, until the herbage is well established, stock should not be turned into fields during periods of excessive rainfall, for fear of puddling the surface.

It is desirable to roll the field early in the spring, especially if there has been much frost during the winter. A top dressing of basic slag (5 to 6 cwt. per acre) may be applied with advantage during the early spring of the third year; this will assist the "sward" to "hold" for a further period and add to the fertility of the soil when the ley is finally broken.

IV. **Trials in Mid-Wales.**—The following is a brief account of the trials conducted in Mid-Wales: Plots ($\frac{1}{4}$ acre) were started in 1916 at (*a*) Pen-y-Bank, Llangybi (Cards.), about 400 ft. above sea-level; (*b*) Talfan, Lampeter (Cards.), at 1,000 ft. above sea-level; (*c*) Llanidloes (Mont.), 1,200 ft. above sea-level; (*d*) Craigol, Newbridge-on-Wye (Brecon), 1,300 ft. above sea-level. Two fields were also put down at Cilmery, Builth Wells (Brecon), at about 650 ft. above sea-level.

The herbage was in every case very poor and of but slight productive value; the field at Llangybi was partially covered with gorse and bracken, and the soil was of a loose and friable nature. The Cilmery fields were of a somewhat similar nature, but without gorse; bracken was present on one of the fields. The Craigol and Llanidloes fields were hill grazing that had probably never been ploughed; at Craigol there was a dense canopy of bracken.

The field at Talfan was very stony and the turf very rough and difficult to plough. It was intended to plough all the fields by Christmas and to leave the turf to partially decay and the sod to disintegrate until May. In no case, however, was the ploughing completed until a considerably later date. At Llangybi the gorse had to be dug by hand and the ploughing was not finished until the end of March. At Cilmery and Craigol the ploughing was not completed until as late as May 10th. The fields were all steep.

Lime (burnt) was applied under the harrows before the seed-bed was prepared at Llangybi (30 cwt. per acre) and Talfan (30 cwt. per acre); basic slag (6 to 8 cwt.) was harrowed in with the seeds at all the centres.

Excellent and clean seed-beds were obtained at Llangybi, Cilmery and Llanidloes. A moderate seed-bed was also obtained at Craigol. It was impossible to obtain a sufficiently good tilth at Talfan, where the ground, as well as being difficult to work, became full of spurrey and sheep sorrel. At this centre seeds mixtures were consequently not put down, but rape and rape and turnips were sown and gave a satisfactory bite of rape and turnips in the autumn; the field will be again ploughed and put down to a rape-pasture this spring.

At each of the other centres the rape-pastures were sown down between 31st May and 24th June; the amount of seed used for the "nurse" drop varied from 3 lb. to 4 lb., and consisted of rape alone, turnips alone, and rape and turnips mixed on the several plots. The seeds took well at every centre, but at Craigol the bracken came up thickly all over the plots and largely smothered the rape and turnips; the "seeds," however, obtained a fair hold on the ground and there was a satisfactory bite of grass, rape and turnips in the autumn; it cannot yet be said, however, whether a remunerative herbage will establish itself. At Llangybi, Cilmery and Llanidloes, the growth of the grasses (especially cocksfoot and rye-grass) and clovers was surprisingly good by the autumn, and the rape and turnips had also given good yields. All the plots were grazed down with sheep ten to twelve weeks after the seeds were sown, and it was apparent when the plots were visited in February that a thoroughly satisfactory sward had been established at each of these three centres. Bracken reappeared to some extent at Llangybi, but this was hand-pulled as it came up; it also came up upon one of the fields at Cilmery, but Mr. Bligh will cut it down with the mowing machine once or twice this summer.

Reports from Mr. Stanley M. Bligh, who put down the fields at Cilmery, and who is experimenting with rape pastures on a large scale in Mid-Wales, show that the expenditure incurred in forming the pastures may be recovered in from 15 to 18 months, and that the profits obtained are far greater than from the original poor hill grazing.

V. **Conclusion.**—It is generally realised that top dressings do not produce immediate results on very poor fields where there is a matted and unproductive herbage. It is better under these circumstances to break up the land and re-seed. When it is intended to establish a rape-pasture, it is of course desirable that the ploughing should be done in the winter. An old turf is broken better under wet conditions and the ploughing can

often be undertaken when the teams would otherwise be idle. It is, nevertheless, often possible to establish a sward on fields with a friable soil when the ploughing is delayed till as late as the middle of May. In the case of very inferior pastures of negligible productive value in hilly districts in Wales and the West of England, farmers who are able to break up such land during the coming months are urged to do so; for, even if a rape-pasture cannot be established this coming June, or if rape and turnips cannot be sown, a summer fallow will bring the field into good condition for crops in the spring of 1918. It should be added that rape is a very valuable feed for sheep, being particularly useful for fattening off wether lambs and draft ewes.

Mole Draining.

WAR Agricultural Committees and farmers who have powerful plough engines at their disposal are urged to consider the possibility of using them during the coming months for mole draining. A large area of wet clay land in the country can never be really productive either under grass or arable crops in its present state. Some of this land has never been drained at all, while in other cases the drains have been laid too deeply or have become hopelessly choked. Owing to the scarcity of labour ordinary pipe draining is now out of the question but, even if labour were available, the cost would often be regarded as prohibitive. Mole draining provides a cheap and effective alternative method of improvement. The total cost before the War was not more than 20*s*. to 25*s*. per acre, and on average clay soils the drains remain effective for 8 to 10 years, or even 15 to 20 years where the conditions are particularly suitable. The cost is often fully recovered in the increased crops obtained the first year.

The mole plough consists of a round steel plug about three inches in diameter attached to the lower end of a strong coulter which is fitted to a suitable frame mounted on wheels. The procedure is similar to that adopted when draining in the ordinary way. The outlet is first decided upon and then the main and sub-main drains are laid. As a rule pipes are used for these and also for the beginning of each mole drain to make a good junction with the main. At the point where the mole drain is to start a hole or "eye" is dug; the coulter with the plug attached is dropped into this and the plough drawn along the line of the proposed drain. The tunnel produced is very

similar to a mole's "run," and if the subsoil is of the right texture and moistness, an efficient drain is obtained. The disturbance caused by the coulter itself is very small and as a rule the cut soon closes up. Even when a crop is being grown on the land the work can be done without causing any very serious damage.

The main drains should be run along the bottom of the field, or, in the case of an uneven field, along the hollows. As an emergency measure main drains can be made by the mole plough and connected with a boundary ditch, or the minor drains can be run direct into a ditch, the laying of pipes being deferred until after the War.

The mole drains are usually made 2 ft. or 2 ft. 3 in. in depth and 7 or 8 yd. apart, though in many cases the distance between the drains is determined by the width of the ridges.

The work can be done only when the surface is sufficiently dry to carry the tackle and when the subsoil is moist; on this account it is usually performed in April or May.

Obviously the system is only of value under certain conditions—the subsoil must be a fairly stiff clay or the holes made by the plug will soon fill up; there must be few, if any, stones so large that they cannot be turned aside by the coulter; and the ground must not be too uneven, as the drain will follow the inequalities of the surface. If the field is laid up in ridges and furrows the drains must follow the line of the furrows and not run across them.

In Essex, where a good deal of mole drainage is performed annually, it is the custom for the tenant to carry out the work and the landlord to find the pipes for the main drains. In cases where the tenant leaves his farm after doing the work compensation is generally given on a basis of three to six years.

The Executives of War Agricultural Committees may be authorised by the Board to undertake the work, and wherever possible, they should arrange with the tenant to pay the cost. It will be found convenient in many cases to agree with the tenant that payment should be spread over a period not exceeding five years. Where the tenant will not agree to pay the cost, the Committee should enter and take possession of the land and carry out the work, afterwards recovering the value of the work done under Para. (4) of Regulation 2M, in a manner similar to that suggested with regard to manuring in Para. (15) of the Board's Circular A 290/C, dated 23rd January, 1917.

Feeding of Poultry.

Since the Board's poultry leaflets were prepared the question of the Food Supply of the Nation has become so serious that it is necessary to reserve sound corn (wheat, barley, rice, and maize) for human consumption to the utmost extent possible, and oats not taken for human food must be reserved for horses. Poultry-keepers should, therefore, avoid using for their fowls wheat, barley, oats, rice and maize, or anything else which is suitable for human consumption.

See the more detailed suggestions below.

The President of the Board of Agriculture and Fisheries desires to call the attention of poultry-keepers to the following suggestions for economy in feeding stuffs, the necessity of which he has already pointed out.

In considering the desirability of any industry connected with the production of food one criterion is paramount: Does the industry really increase the national food supply? When the poultry industry is tested in this way the following results are reached:—

An average pullet in the first 18 months of her life consumes 100 lb. of corn and meal, or their equivalent, lays about 180 eggs, and if killed weighs about 4½ lb. The dry edible human food contained in her carcass and in the eggs she has laid amounts to about 6½ lb., so that she has consumed about 15 lb. of corn and meal, or their equivalent, for every pound of dry edible human food she has produced.

If the corn and meal she consumes are fit for human food, then the result is to decrease the national food supply. If she is fed on scraps, waste, tail corn, or other materials not fit for human food, then the national food supply is increased.

Applying the same test to other kinds of live stock it appears that pigs are rather more economical from the national point of view than poultry.

The President, therefore, makes the following suggestions to poultry-keepers:—

(1) Where poultry are kept in such small numbers that they can live almost entirely on scraps, waste products, tail or damaged corn, and other materials quite unfit for human food, they should be encouraged, because they increase the national food supply.

(2) Where, however, the amount of scraps and waste products is sufficiently large to feed a pig, the pig should be kept in preference to poultry, because the pig is a more economical producer of human food.

(3) Where the quantity of poultry is too large to be fed as above, it must be remembered that the unproductive season is now passed and that laying hens will now be in full profit, and will produce on the average 1 egg, containing ½ oz. of dry human food, for every 2½ oz. of corn consumed. The waste is still considerable, for 5 oz. of corn are required to produce 1 oz. of dry human food, but if every effort is made to use foods which are unfit for human consumption, such as tail corn, fish meal, the coarser wheat offals, etc., and to avoid using maize, sound oats, barley or wheat, egg-producing establishments should keep their hens until the present laying season is over. After about July, stocks should undoubtedly be reduced until such time as corn again becomes plentiful.

(4) Establishments concerned in the production of table poultry, expecially those which specialise in fattening and cramming, should limit their activities to such an extent as is compatible with the condition of using no corn or meal fit for human consumption.

(5) Breeding establishments should also be curtailed, for the number of fowls in the country must be decreased because of the shortage of suitable feedings tuffs.

Use of Surplus Brewers' Yeast for Stock Feeding.

THE attention of the Board has been directed to the possible utilisation as food for stock of the surplus yeast of the breweries which is at present being thrown away.

In a few of the larger breweries the surplus yeast is dried artificially in plant specially designed for the purpose, and the product is being successfully used for stock feeding under the name of "dried yeast." The composition varies according to the kind of yeast, but average samples contain 45 to 50 per cent. of albuminoids, 1 to 3 per cent. of oil, and 25 to 30 per cent. of carbohydrates. Where the surplus of yeast is sufficient to warrant the necessary outlay on drying plant, this method is undoubtedly the most satisfactory mode of preparing the yeast for use as food for stock.

Where the supplies do not warrant this expenditure, the yeast can be most conveniently sent out in compressed form, containing 75 to 85 per cent. of moisture. Before this can

safely be fed to stock, however, it must be well steamed or boiled in order to ensure complete destruction of the vitality of the yeast. It can then be fed at the rate of 5 to 10 lb. per day in admixture with chaffed hay or straw to milch cows or fattening bullocks, or to pigs at the rate of 1 to 3 lb. per day, according to size. The yeast must be in fresh, unfermented condition; samples showing any sign of putrefaction must be strictly avoided. If the yeast is strongly contaminated with hop resin it should be washed with water at the brewery before compressing. Where facilities for drying are available the yeast may be mixed before drying with straw chop, ground tail corn and other materials which will facilitate the drying and give a useful mixed food. Good results are said to have been obtained with cakes prepared in this way from a mixture of 100 parts yeast, 25 to 30 parts pressed spent hops, 1 to 2 parts fine straw chop, and 2 parts of salt, and also with similar cakes made from a mixture of equal parts of pressed yeast and barley. It is reported that cows and young cattle took the yeast cakes readily in admixture with other foods, and gave very satisfactory results. Efficient drying and fresh, sound yeast are essential. It is suggested that farmers might direct the attention of the smaller breweries to the possibility of using their surplus yeast and other waste in this manner.

Notes on Feeding Stuffs in May: *From the Animal Nutrition Institute, Cambridge University.*

SINCE last month prices have risen all round. In most cases the rise has been about 1*d.* per unit. Cakes have risen rather more, from 2*d.* to 4*d.* per unit. The greatest advance is shown by treacle and distillers' grains.

Farmers should interpret this general rise in price as a further warning of the decrease in quantity of feeding stuffs, which must get more and more acute as time goes on. It is to be hoped that every owner of live stock will endeavour to act up to the spirit of the manifesto* issued by the President of the Board of Agriculture, which means an adequate but not excessive ration of concentrated food for working horses and milking cows, and a minimum of concentrated food for all other kinds of stock, including fattening cattle, sheep, pigs, and poultry.

* This has been reprinted as Special Leaflet, No. 76, a copy of which may be obtained gratis and post free on application to the Board, 3, St. James's Square, London, S.W. 1.

It is, perhaps, hardly justifiable to use the term "fattening" at all, for what is commonly known as fattening must be discontinued. Any owner of live stock who uses concentrated food in ordinary quantities for fattening purposes, is either robbing milking cows or horses, or using more than his fair share, so that other owners of live stock must go short. If the practice of fattening continues, the Government may be compelled to take some kind of action to prevent it, such as, for example, the fixing of such maximum prices for meat as would make fattening unremunerative.

Horses.—No horse, that is not doing productive work, should get any corn at all. Farm horses should go out to

TABLE I.

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of March.																					
		London.			Liverpool.			Hull.			Bristol.			Glasgow.			Leith.						
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.				
Soya Bean Cake	122·3	19	10	0		—			—			—			—			—					
Decorticated Cotton Cake	126·3	19	0	0	19	15	0		—		20	0	0		—			—					
Decorticated Cotton Meal	126·3	19	0	0		—			—			—			—			—					
American Linseed Cake	119·0	20	5	0		—			—			—			—			—					
Indian Linseed Cake	123·1		—		20	15	0		—			—		20	0	0	20	5	0				
Russian Linseed Cake	123·5		—			—			—			—			—			—					
English Linseed Cake	120·1	20	15	0	21	0	0	20	0	0	20	15	0	20	10	0	20	10	0				
Bombay Cotton Cake	65·3	15	0	0	16	10	0		—			—			—			—					
Egyptian Cotton Cake	71·9	16	0	0	17	0	0	15	10	0	16	5	0	16	0	0	16	0	0				
Coconut Cake	102·6		—			—			—			—			—			—					
Palm Kernel Cake	96·1	15	10	0	15	15	0	14	10	0	15	10	0	16	0	0	‡16	5	0				
Palm Kernel Meal (extracted)	92·5	15	5	0		—			—			—			—			—					
Ground-nut Cake	145·2	18	10	0		—		17	10	0		—			—			—					
English Beans	99·5	18	2	1	20	15	4	19	7	4		—			—			—					
Bean Meal	99·5		—			—			—			—			—			—					
Chinese Beans	101·2	Nominal.				—			—			—			—			—					
English Maple Peas	97·2	20	0	0		—		22	4	5		—			—			—					
English Dun Peas	97·2	17	15	6		—		18	17	9		—			—			—					
Calcutta White Peas	97·5	20	11	1		—			—			—			—			—					
American Maize	93·8	16	18	4		—			—			—		}	—		20	10	0				
Argentine Maize	94·2	18	13	4		—			—		17	19	4										
Maize Meal	86·5	18	0	0	18	10	0	19	5	0	18	0	0		—		21	0	0				
Maize Gluten Feed	121·6	16	3	9	18	0	0		—		17	10	0		—			—					
Maize Germ Meal	99·2	17	2	6	18	7	6		—		18	0	0		—			—					
English Feeding Barley	83·0	18	4	0		—		18	4	0		—			—			—					
English Oats	75·4	21	13	4		—		19	15	0	19	10	0	}	19	15	0		—				
Argentine Oats	75·4	23	11	7		—			—			—											
Malt Culms	69·9	13	2	6		—		11	0	0	12	0	0		13	10	0	15	10	0			
Brewers' Grains (dried)	84·5	15	5	0		—		14	0	0	15	0	0		15	0	0		—				
Brewers' Grains (wet)	21·1	2	10	0		—		2	0	0		—			—			—					
Distillers' Grains (English)	101·2	15	5	0		—			—		15	10	0	}	15	5	0	15	10	0			
Distillers' Grains (French)	101·2	15	10	0		—			—			—											
Distillery Mixed Grains (wet)	20·0		—			—			—			—			—			—					
Egyptian Rice Meal	78·7	Nominal.				—			—			—			—			—					
Burmese Rice Meal	78·7	Nominal.				—			—			—			—			—					
Rice Bran	78·7		—			—			—			—			—			—					
Wheat Middlings (coarse)	94·8	14	5	0		—			—			—		16	0	0	15	5	0				
Wheat Sharps	90·5	14	15	0	15	10	0	14	15	0	15	5	0	15	5	0	14	10	0				
Wheat Pollards	96·7		—		14	10	0		—			—			—			—					
Wheat Bran	77·5	12	0	0		—		14	5	0	13	10	0	15	10	0	14	0	0				
Wheat Bran (broad)	79·9	13	0	0	14	15	0	16	5	0	14	7	6	15	15	0	15	0	0				
Feeding Treacle	60·0	18	0	0	19	0	0		—			—		21	10	0	23	0	0				
Linseed	153·5	31	0	0	*35	0	0	32	6	2	32	0	0		—		31	10	0				
Linseed Oil	250·0	56	0	0	†56	0	0	52	0	0	4/6 *per gal.*				—			—					
Egyptian Cotton Seed	108·6	19	0	0		—		20	7	6		—			—			—					
Bombay Cotton Seed	99·6		—			—			—			—			—			—					
Cotton Seed Oil	250·0	58	5	0	†70	0	0		—			—			—			—					
Fish Meal	145·0		—			—			—			—		14	10	0	15	10	0				
Locust Bean Meal	80·0		—			—			—			—			—			—					

* Cleaned. † In barrels. ‡ Carriage paid to any station.

TABLE II.

LONDON. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	4½	Brewers' grains (dried) ..	3	7¼
Ground nut cake ..	2	6½	American maize ..	3	7¼
Maize gluten feed ..	2	8	English beans	3	7¾
Decorticated cotton cake	3	0	English dun peas ..	3	8
Decorticated cotton meal	3	0	Malt culms	3	9
Distillers' grains (English)	3	0¼	Argentine maize ..	3	11½
Distillers' grains (French)	3	0¾	Linseed	4	0½
Wheat middlings (coarse)	3	1¼	English maple peas ..	4	1¾
Wheat bran	3	1¼	Maize meal	4	2
Soya bean cake	3	2¼	Calcutta white peas ..	4	2¾
Palm kernel cake ..	3	2¾	English feeding barley ..	4	4½
Wheat sharps	3	2¾	Egyptian cotton cake ..	4	5½
Wheat bran (broad) ..	3	3	Linseed oil	4	6
Palm kernel meal ..	3	3½	Bombay cotton cake ..	4	7¼
Coconut cake	3	4½	Cotton seed oil	4	8
American linseed cake ..	3	4½	English oats	5	8¾
English linseed cake ..	3	5½	Feeding treacle	6	2
Maize germ meal ..	3	5½	Argentine oats	6	3
Egyptian cotton seed ..	3	6			

TABLE III.

LIVERPOOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	2	11¾	English beans	4	2¼
Decorticated cotton cake	3	1½	Maize meal	4	3¼
Palm kernel cake ..	3	3¼	Linseed oil	4	6
Wheat pollards	3	4	Linseed	4	6¾
Indian linseed cake ..	3	4½	Egyptian cotton cake ..	4	8¾
Wheat sharps	3	4½	Bombay cotton cake ..	5	0½
English linseed cake ..	3	6	Cotton seed oil	5	7
Maize germ meal ..	3	8½	Feeding treacle	6	3½
Wheat bran (broad) ..	3	8½			

TABLE IV.

HULL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	1	10¾	English dun peas ..	3	10½
Ground nut cake ..	2	5	Wheat bran (broad) ..	4	1
Palm kernel cake ..	3	0¼	Linseed oil	4	2
Malt culms	3	2	Linseed	4	2¾
Wheat sharps	3	2½	Egyptian cotton cake ..	4	3½
Brewers' grains (dried) ..	3	3½	English feeding barley ..	4	4½
English linseed cake ..	3	4	Maize meal	4	5½
Wheat bran	3	8¾	English maple peas ..	4	6¾
Egyptian cotton seed ..	3	9	English oats	5	2¾
English beans	3	10½			

TABLE V.

BRISTOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	2	10½	Brewers' grains (dried) ..	3	6½
Distillers' grains (English)	3	0¾	Wheat bran (broad) ..	3	7¼
Decorticated cotton cake	3	2	Maize germ meal ..	3	7½
Palm kernel cake ..	3	2¾	Argentine maize	3	9½
Wheat sharps	3	3½	Maize meal	4	2
Malt culms	3	5¼	Linseed	4	2¼
Coconut cake	3	5¼	Egyptian cotton cake ..	4	6¼
English linseed cake ..	3	5½	English oats	5	2¼
Wheat bran	3	5¾			

TABLE VI.

AVERAGE PRICES PER FOOD UNIT.

LONDON, LIVERPOOL, HULL AND BRISTOL.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	1¾	Maize germ meal ..	3	7
Ground nut cake ..	2	5¾	American maize ..	3	7¼
Maize gluten feed ..	2	10	Egyptian cotton seed ..	3	7½
Decorticated cotton meal	3	0	Wheat bran (broad) ..	3	8
Distillers' grains (English)	3	0½	English dun peas ..	3	9¼
Decorticated cotton cake	3	1	Argentine maize	3	10½
Wheat middlings (coarse)	3	1¼	English beans	3	10¾
Palm kernel cake ..	3	2¼	Calcutta white peas ..	4	2¾
Soya bean cake	3	2¼	Maize meal	4	3¼
Wheat sharps	3	3¼	Linseed	4	3¼
Palm kernel meal ..	3	3½	English maple peas ..	4	4
Wheat pollards	3	4	English feeding barley ..	4	4½
Indian linseed cake ..	3	4½	Linseed oil	4	4½
American linseed cake ..	3	4½	Egyptian cotton cake ..	4	6
Coconut cake	3	4¾	Bombay cotton cake ..	4	10
Wheat bran	3	5	Cotton seed oil	5	1½
English linseed cake ..	3	5¼	English oats	5	6½
Malt culms	3	5¼	Feeding treacle	6	2¾
Brewers' grains (dried) ..	3	5¾	Argentine oats	6	3
Distillers' grains (French)	3	6¾			

TABLE VII.

GLASGOW. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	0	Brewers grains (dried) ..	3	6½
Distillery mixed grains (dried)	3	0¼	Malt culms	3	10½
Indian linseed cake ..	3	3	Wheat bran (broad) ..	3	11½
Wheat sharps	3	3¾	Wheat bran	4	0
Palm kernel cake ..	3	4	Egyptian cotton cake ..	4	5½
English linseed cake ..	3	5	Oats	5	2¾
Wheat mid lings ..	3	5¾	Feeding treacle	7	2¼

TABLE VIII.

LEITH. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	1¾	Wheat bran	3	7¼
Distillery mixed grains (dried)	3	0¾	Wheat bran (broad) ..	3	9
Wheat sharps	3	2	Crushed linseed	4	1½
Indian linseed cake ..	3	3½	Maize	4	4¼
Wheat middlings ..	3	3¾	Malt culms	4	5¼
Palm kernel cake ..	3	4¾	Egyptian cotton cake ..	4	5½
English linseed cake ..	3	5	Maize meal	4	10¼
			Feeding treacle	7	8

TABLE IX.

AVERAGE PRICES PER FOOD UNIT.

GLASGOW AND LEITH.

	s.	d.		s.	d.
Fish meal	2	1	Wheat bran	3	9½
Distillery mixed grains (dried)	3	0½	Wheat bran (broad) ..	3	10¼
Wheat sharps	3	3	Crushed linseed	4	1½
Indian linseed cake ..	3	3¼	Malt culms	4	1¾
Palm kernel cake ..	3	4¼	Maize	4	4¼
Wheat middlings ..	3	4¾	Egyptian cotton cake ..	4	5½
English linseed cake ..	3	5	Maize meal	4	10¼
Brewers' grains (dried) ..	3	6½	Oats	5	2¾
			Feeding treacle	7	5

grass as soon as possible. Meantime, the following foods in order of cheapness may be used to replace oats, which have risen more than 6*d.* per unit since last month: maize gluten feed, wheat pollards or bran, linseed cake, malt culms, brewers' or distillers' grains, maize germ meal. The ration suggested last month may be repeated:—

3 lb. dried brewers' or distillers' grains.
5 „ pollards or 6 lb. bran.
1 „ gluten feed.
1 „ linseed cake.

This ration is equivalent to 12 lb. of oats.

Milking Cows.—The ration suggested last month—2 lb. decorticated cotton cake and 3 lb. gluten feed—may be continued until cows go out to grass. For the first fortnight or so after they go out it is advisable to give 2 lb. of cotton cake per head per day. Despite its high price, cotton cake is worth using for this purpose because it prevents scouring on the young grass.

Cattle for Beef Production.—Two-year-olds on good grass land which will normally fatten them should get no cake.

Similar cattle on grass, not good enough to fatten, should get no cake until the aftermath comes, when they may get a small allowance.

Older cattle should run on the poorer grass all the summer and finish on roots and straw with a little cake, if there is still any available next winter.

Yearlings in fresh condition should get 2 or 3 lb. of cake per head per day in May and June, so that they may come to the

TABLE X.

(1) Name of Feeding Stuff.	(2) Nutritive Ratio.	(3) Per cent. digestible. Protein.	(4) Per cent. digestible. Fat.	(5) Per cent. digestible. Carbo-hydrates and Fibre.	(6) Starch equiv. per 100 lb.	(7) Linseed Cake equiv. per 100 lb.
Foods rich in both Protein and Oil or Fat.						
Ground nut cake	1 : 0·8	45·2	6·3	21·1	77·5	102
Soya bean cake	1 : 1·1	34·0	6·5	21·0	66·7	88
Decort. cotton cake	1 : 1·2	34·0	8·5	20·0	71·0	93
Linseed cake, Indian	1 : 1·9	27·8	9·3	30·1	77·1	101
Linseed cake, English	1 : 2·0	26·7	9·3	30·1	76·0	100
Cotton cake, Egyptian	1 : 2·1	15·5	5·3	20·0	40·0	53
Cotton cake, Bombay	1 : 2·5	13·1	4·4	21·5	37·6	49
Distillers' grains (English)	1 : 2·9	18·7	10·2	29·0	57·3	75
Distillers' grains (French)						
Maize gluten feed	1 : 3·0	20·4	8·8	48·4	87·4	115
Brewers' grains, dried	1 : 3·5	14·1	6·6	32·7	50·3	66
Coconut cake	1 : 3·8	16·3	8·2	41·4	76·5	101
Palm kernel cake	1 : 4·5	14·1	6·1	48·9	76·7	101
Linseed	1 : 5·9	18·1	34·7	20·1	119·2	157
Bombay cotton seed	1 : 6·6	11·0	16·8	30·1	77·5	102
Fairly rich in Protein, Rich in Oil.						
Maize germ meal	1 : 8·5	9·0	6·2	61·2	81·0	107
Rice meal	1 : 9·4	6·8	10·2	38·2	68·4	90
Rich in Protein, Poor in Oil.						
Fish meal	1 : 0·1	54·0	4·0	—	60·0	78
Peas, Calcutta white	1 : 2·1	23·3	1·1	45·9	66·9	88
Beans, English	1 : 2·6	19·3	1·2	48·2	67·0	88
Beans, Chinese	1 : 2·6	19·6	1·7	47·9	67·0	88
Peas, English maple	1 : 3·1	17·0	1·0	50·0	70·0	92
Palm-nut meal (extracted)	1 : 3·4	15·6	1·9	48·7	66·1	87
Brewers' grains, wet	1 : 3·5	3·5	1·5	8·6	12·7	17
Malt culms	1 : 3·6	11·4	1·1	38·6	38·7	51
Cereals, Rich in Starch, not Rich in Protein or Oil.						
Barley, feeding	1 : 8·0	8·0	2·1	57·8	67·9	89
Oats, English	1 : 8·0	7·2	4·0	47·4	59·7	79
Oats, Argentine	1 : 8·0	7·2	4·0	47·4	59·7	79
Maize, American	1 : 11·5	6·7	4·5	65·8	81·0	107
Maize, Argentine	1 : 11·3	6·8	4·5	65·8	83·5	110
Maize meal	1 : 13·0	5·5	3·5	63·9	77·8	102
Wheat middlings, fine	1 : 4·8	13·2	3·0	53·8	72·0	95
Wheat middlings, coarse or sharps	1 : 5·1	13·8	4·3	50·5	64·0	84
Wheat pollards	1 : 4·5	11·6	4·0	51·6	60·0	79
Wheat bran	1 : 4·7	11·3	3·0	45·0	49·7	65
Wheat bran, broad	1 : 4·7	11·3	3·0	45·4	48·1	63
Locust bean meal	1 : 22·1	4·0	0·7	69·2	71·4	94

butcher in July. They should start on cotton cake, which may be gradually replaced by ground nut cake or palm kernel cake. Yearlings in poor condition should get no cake until the autumn. A small allowance of cake during September and October will bring most of them to the butcher by the end of the latter month. The rest can be kept over the winter on grass with a little hay, for grazing in the summer of 1918.

Sheep should be dealt with on the same general lines as above.

Wether lambs, born early, should get a very small allowance of cake, ground nut or linseed, not more than ½ lb. per head per day, and should go to the butcher as soon as they reach 120 to 130 lb. live weight.

Later lambs should run on grass with no cake until they go on to the roots next October.

Pigs have been dealt with fully in the last three months' notes, to which readers are referred.

Notes on Manures in May: *From the Rothamsted Experimental Station.*

THE time for applying fertilisers is now over for most of the ordinary crops, but there are two points to which attention ought to be given.

1. Careful note should be made of the effects of the fertilisers used with a view to improving the manurial scheme next year.

2. In view of difficulties of manufacturing, transport, etc., orders for next season's fertilisers should be placed during this season.

The difficulty of preparing adequate amounts of superphosphate last season led to experiments with mineral phosphates alone, and with mixtures of mineral phosphates and superphosphates. These experiments have not gone on long enough to yield very definite conclusions, but certain general points are indicated which may now be set out.

The chief experiments have been made at Cockle Park, Bangor, Aberdeen, and in Ireland.

On Grass Land.—In the Cockle Park experiments both Tunisian and Belgian phosphates proved satisfactory on a three years' grass ley. The following results were obtained :—

*Cockle Park. Three years' Grass Ley. Yield of Hay, cwt. per acre.**

—	1st Test, 1911–13.				2nd Test, 1912–14.				3rd Test, 1913–15.			
	1st Year 1911.	2nd Year 1912.	3rd Year 1913.	Average.	1st Year 1912.	2nd Year 1913.	3rd Year 1914.	Average.	1st Year 1913.	2nd Year 1914.	3rd Year 1915.	Average.
Unmanured	18¾	35	46	33¼	33¾	42	24	33¼	33½	37½	22	31
Basic slag	25½	42	50½	39½	35½	48½	35	39½	44½	48½	27½	40
Tunisian rock phosphate	26½	36½	49½	37½	35½	49½	32½	39	35	41¾	30¾	36
Belgian rock phosphate alone	—	—	—	—	35½	50½	34½	40	41	39½	29	36
Belgian rock phosphate + superphosphate ..	—	—	—	—	37¾	52½	36	42	—	—	—	—

* Cockle Park Bull. 24, 1916, pp. 34–40.

The slag and phosphatic rocks each contained 200 lb. of phosphoric acid per acre, corresponding to nearly 10 cwt. of 41 per cent. basic slag; in the last plot on the list the mixture contained equal parts of phosphoric acid in the form of rock phosphate and of superphosphate. Another experiment indicated that the Belgian phosphate did even better when it was calcined. The results are distinctly promising and show that mineral phosphates may prove of considerable value on grass land.

It is very desirable that these experiments should be repeated elsewhere on poor grass land. These mineral phosphates contain a good deal of calcium carbonate, and they are, of course, considerably cheaper than slag; in this case the phosphate of lime cost only 9*d.* per unit against 1*s.* 3*d.* in basic slag.

Tests have been made with meadow hay at 31 centres in 22 counties in Ireland.† The results per acre were :—

No phosphate	52¾ cwt. of hay.
3 cwt. Tunisian phosphate	59 ,, ,,
3 ,, Tunisian phosphate + superphosphate (2 : 1)	63¼ ,, ,,
3 ,, superphosphate	63½ ,, ,,

In all four cases 1 cwt. of nitrate of soda was applied to the land.

Swedes and Turnips.—Both at Aberdeen and in North Wales mineral phosphates have given good results with swedes. At Aberdeen‡ the yields were :—

† A.B. Memo. No. 4, 1917. ‡ Aberdeen and N. of Scotland Bull. 10, 1909.

	Tons	*cwt.*
No manure	16	18½
Florida phosphate	19	18
Superphosphate	22	1¼

The rock phosphate is thus not as good as superphosphate; observation showed that the braird was very much behind that obtained with superphosphate or slag. Other experiments indicate, however, that an addition of superphosphate to the rock phosphate gets over this difficulty, and thus considerably increases its value. Thus at Balblair the following results were obtained :—*

	Yield of Turnips.	
	Tons	*cwt.*
Mineral phosphates (5½ cwt.)	13	19
Mineral phosphates (5½ cwt.) + superphosphate (2¾ cwt.)	16	13
Superphosphate (7 cwt.)	16	6

The same basal dressing was given in each case.

In the North Wales experiments† the mineral phosphate (Gafsa) acted almost as well as superphosphate, and the conclusion is drawn that, if finely ground, mineral phosphate may without hesitation be tried for swedes.

Potatoes.—The Irish experiments made at 42 centres in 25 counties show that mineral phosphates produce only a small effect, but when mixed with superphosphate they produce nearly as large an increase as unmixed superphosphate. Thus the following yields were obtained when phosphates were added to a basal dressing of dung and sulphate of ammonia :—

	Saleable.		*Total Yield.*	
	Tons	*cwt.*	*Tons*	*cwt.*
No phosphate	6	5 ..	8	4
4 cwt. Tunisian phosphate	6	11 ..	8	11¾
4 „ Tunisian phosphate + superphosphate (2 : 1)	7	3 ..	9	4¾
4 „ superphosphate	7	9 ..	9	11¼

Mangolds.—Again we have to turn to Ireland for published information. The following results are recorded, the basal dressings being as before—dung + sulphate of ammonia :—

	Tons	*cwt.*	
No phosphate	30	12	per acre.
4 cwt. Tunisian phosphate	33	7	„
4 „ Tunisian phosphate + superphosphate (2 : 1)	34	17	„
4 „ superphosphate	34	17	„

* Aberdeen and N. of Scotland Leaflet 51. † Bull. 6, 1914.

Further experiments are desirable. The evidence is open to criticism, but on the whole it indicates that supplies of superphosphate can be eked out by mixing with mineral phosphate. The superphosphate gives the young plant a start, and the mineral phosphate can be taken up later on and more slowly as the root system develops. It is hoped that this mixture will not long have to be used, but at any rate it appears to tide over one of the difficulties of the situation. More information will be available before next season's manurial scheme is needed.

Unit Prices of Artificial Manures in May.—The statement on p. 201 shows the cost to the purchaser of 1 per cent. per ton of nitrogen, and soluble and insoluble phosphates derived from various sources, at certain ports and manufacturing centres, for May, 1917.

NOTE.—These unit prices are based on the *probable* retail cash prices in bags f.o.r. for quantities of not less than 2 tons of the manures mentioned at the ports and places specified, but it should be borne in mind that market prices are fluctuating considerably at the present time. The pricks are published by the Board of Agriculture and Fisheries for use in comparing the commercial values of artificial manures. They may also be used as a guide to the probable price per ton of any of the manures mentioned if the unit prices of the constituents of the manure are multiplied by the percentages of the constituents found in it, and due allowance is made for the difference between cash prices and credit prices, and for cost of carriage from the nearest centre to the place where it is delivered to the purchaser. If used in connection with the valuation of a compound manure regard must be had to the sources of the constituents, and a reasonable sum must be added for mixing, disintegrating, and rebagging the ingredients, bags, and loss of weight.

	England and Wales.										Scotland.	
	London.	King's Lynn.	Hull.	Newcastle.	Silloth.	Liverpool.	Widnes.	Newport.	Bristol.	Plymouth.	Glasgow.	Leith.
Nitrogen from :	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sulphate of Ammonia 95 %	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 4½	15 6	15 6
pure .. 93 %	—	—	—	—	—	—	—	—	—	—	—	—
Calcium Cyanamide (Nitrolim)	20 8	—	—	—	—	—	—	—	—	20 0	—	—
Nitrate of Soda 95 %	—	—	28 10	—	—	30 8	31 9	—	29 8	29 0½	—	29 8
pure .. 90 %	28 10	—	—	—	—	—	—	—	30 8	—	—	—
Nitrate of Lime ..	—	—	—	—	—	—	—	—	—	—	—	—
Castor Meal	—	—	24 2½	—	—	—	—	—	—	—	—	—
Allowed for Insol. Phos.	—	—	*2 0*	—	—	—	—	—	—	—	—	—
Allowed for Potash ..	—	—	*15 0*	—	—	—	—	—	—	—	—	—
Soluble Phosphates from :												
Superphosphate 35 %	3 11	—	3 6	4 0	4 0	4 0	3 11	—	—	—	—	—
,, 33 %	3 11½	—	3 5	—	—	4 0	3 11½	4 2	—	—	—	—
,, 30 %	4 2½	—	3 6	3 10	4 1	4 1	4 0	4 1	4 1	4 1	—	4 6
,, 26 %	4 6	—	3 10	4 3	4 5	4 6	4 6	—	—	4 4	—	—
Dissolved Bones ..	6 2½	—	5 3½	5 7	5 4	—	—	6 2	6 4	6 1½	—	—
Allowed for Nitrogen ..	*22 0*	—	*18 9*	*19 10*	*18 11*	—	—	*21 10*	*22 5½*	*21 8*	—	—
Allowed for Insol. Phos.	*3 5½*	—	*2 11½*	*3 1½*	*2 11½*	—	—	*3 5*	*3 6½*	*3 5*	—	—
Insoluble Phosphates (Citric Soluble) from:												
Basic Slag	2 8	2 7½	2 11	—	—	2 6½	—	—	3 6	3 6½	3 3½	3 3½
Insoluble Phosphates from :												
Basic Slag	2 4	—	2 3½	2 0	—	—	—	—	—	3 0	—	—
Bone Meal	3 0½	—	3 6½	—	2 10	3 1½	3 0	2 11½	3 1½	3 2½	—	—
Allowed for Nitrogen ..	*19 4½*	—	*22 5½*	—	*18 1½*	*19 10*	*19 1*	*18 9*	*20 0*	*20 3½*	—	—
Steamed Bone Flour ..	2 11	—	2 11½	—	—	—	—	2 5½	2 8	2 9	—	—
Allowed for Nitrogen ..	*18 7*	—	*18 9*	—	—	—	—	*15 8*	*17 0*	*17 6½*	—	—
Fish Guano	—	3 10½	3 1	—	—	3 4	—	—	—	—	—	—
Allowed for Nitrogen ..	—	*24 9*	*19 6½*	—	—	*21 2½*	—	—	—	—	—	—
Potash	No quotations.											

Food Production Societies.

THE production of more food is one of the chief means of winning the War. The work of doing this must not be left exclusively to the farmer. Every small cultivator, gardener, allotment holder and cottage gardener can help.

In order to produce the maximum results all existing gardens must be cultivated and made to yield the highest possible results and, wherever possible, more land must be brought under garden cultivation.

To secure these ends, combined efforts on the part of villagers and of the residents in rural and urban districts are necessary.

One important means of bringing about this combination of effort lies in the formation of a Food Production Society in every village and urban district. Where such societies have been formed it has been found possible to do more than can be accomplished by individual effort.

In order to encourage the formation and promote the work of Food Production Societies, the Horticultural Section of the Food Production Department of the Board offers the following suggestions :—

The Work which Food Production Societies can do.—The work of a Food Production Society must vary according to the locality —for example, that which can be undertaken by a village society differs from that to be done by a society formed in an urban district.

Village Food Production Societies.—1. Make known to everybody the vital importance both of increased food production and of the economical use of food.

2. Secure that every existing garden plot and allotment is made as productive as possible.

Help cottagers who lack the labour to do it themselves to get their gardens or allotments dug. See that the gardens and allotments of men on military service are cultivated. When this involves expense, the actual cost may, in some instances, be recovered from the occupier who is unable himself to do the necessary work. Once the ground is dug the women and older children can look after the planting. In some districts school children are helping in this work, and it is often possible to obtain soldier labour from Labour Exchanges. Application should be made through the War Agricultural Committees for temporarily released soldier labour, or direct to the Commanding Officer of any local unit. When making application, state what labour is required and which scale of payment will

be made. Soldier labour is paid for at the rate of 4*s.* per man per day, or 2*s.* 6*d.* if board and lodging are provided. Where voluntary part-time labour is available, organise it so that it may be used to the best effect.

3. Make out seed orders early in order to obtain at the lowest price and in good time the best varieties of seeds. If one order is made for each village the cost will be less than if everyone sends his own seed order.

4. Teach economy in the use of seeds, for the seeds of some kinds of vegetables are very scarce. Save seeds of scarlet runners, French beans and garden peas for planting next year.

5. Start a seed and potato "seed" fund in order to secure that next year the seed orders are placed early so that the best seeds may be obtained, and that Scotch and Irish potatoes, of kinds which do well in the neighbourhood, may be ordered well before planting time. Scotch or Irish seed potatoes give from ¼ to ½ bush. per 10 rods more potatoes than are produced by English-raised seed.

6. Provide for an inspection of tools. If any tools are worn out or unsuitable get people who can lend or give suitable tools to do so. Encourage the use of labour-saving garden tools, *e.g.* a Planet Junior Hoe, owned co-operatively, saves much labour in the garden.

7. Hold demonstrations showing the inexperienced how to use tools—for example, the spade and hoe.

8. Arrange with the Food Production Department for the spraying of potatoes in order to prevent loss of the crop from disease.

9. Provide for the fencing of all allotments and other garden ground.

10. Enlist the services of professional gardeners in the neighbourhood for the purpose of (1) advice and instruction; (2) raising supplies of good and suitable varieties of cabbage and other brassicas for distribution to cottagers and allotment-holders.

11. Encourage the best methods of cropping, intercropping and successional cropping (see the Royal Horticultural Society's pamphlets on "Cropping in Allotments and Small Vegetable Gardens," the "Cultivation of Potatoes," the "Cultivation and Manuring of Kitchen Gardens," and "Late Summer-sown Vegetables"; see also the Board's Leaflets, and their pamphlet *How to Manage an Allotment*, price 1*d.*, post free).

12. Encourage in particular the sowing in late summer (*e.g.* mid July) of crops which remain in the ground during the

winter and provide a useful supply of food during the winter and spring—beet, turnip, carrot, onion, cabbage, savoy and kale.

13. Provide not only for the needs of a village but aim at having a surplus, and before the crops are ready make arrangements for marketing the surplus or for preserving it for future use. "Standardize" those crops likely to yield a surplus for marketing, *i.e.* encourage the cultivation by everybody of *the same* varieties of each kind of vegetable, choosing those which are known to do well in the district, in order to obtain the best price for marketed produce.

14. Teach the importance of the proper clamping or storing of potatoes to prevent loss from frost, etc. (See the Board's Leaflet No. 296, *Potato Growing in Allotments and Small Gardens.*

15. Arrange for the purchase and distribution of manures. Encourage the economical and proper use of artificial manures.

16. Arrange with the Food Production Department for demonstrations in the preserving of fruit and vegetables.

17. Vegetable shows may be held if desired, but prizes should be given for the best cropped and most productive gardens, and not for the *biggest* vegetables. Encourage quality and quantity, not merely size.

18. Generally promote "small cultivation" in gardens and allotments, the keeping of bees and also animals for food purposes (pigs, rabbits, chickens, etc.).

Wherever possible, the Society should take up fresh land for cultivation, renting it from the parish council or from private owners. Such land may be either divided into allotment plots or cultivated on a co-operative system. *Ground for vegetables, even if not dug before early summer, may be used for late summer-sown crops.*

To Form a Village Food Production Society.—In parishes where no organisation of this kind exists the parish council should take the lead in establishing one, and in that case it should invite the co-operation of all members of the community, and not make a Food Production Society solely an official organisation. Failing the parish council, persons of influence, the clergy, other ministers of religion, the squire, the schoomaster, neighbouring gardeners should take the initiative, form a committee of men and women able to give time to the work, seek the active support of the local authority, and after making a preliminary draft of a scheme suitable to the village, call a meeting of residents in order to explain the objects of the proposed society and the way in which these objects may be

attained. At the meeting the society should be constituted and the officers elected.

Horticultural Representatives.—The Food Production Department is appointing a horticultural representative in each rural and urban district. Where a district organisation for horticultural purposes already exists, it is hoped that the horticultural representative will be appointed from among its members and will continue to act with that organisation. The horticultural representatives will assist the Village Food Production Societies in carrying out their work, and in making their special requirements known to the Food Production Department.

The horticultural representatives should also co-operate with the county horticultural instructor or organiser.

The following leaflets may be had free by a Food Production Society or similar organisation on application to the Food Production Department :—

1. Urban Food Production Societies.
2. Economy in the Use of Seeds.
3. Potato Spraying (arrangements for spraying the potatoes grown by small cultivators in 1917).
4. Fruit and Vegetable Preserving (arrangements for providing instruction during the summer of 1917).
5. Free Advice by Garden Experts (The Royal Horticultural Society's Panel of Patriotic Gardeners).
6. Royal Horticultural Society's Pamphlets :—
 a. The Cropping of an Allotment or Small Kitchen Garden.
 b. The Cultivation and Manuring of the Kitchen Garden.
 c. Autumn Vegetables.
 d. Cultivation of Potatoes in Gardens and Allotments.

The Secretaries of all Food Societies, Allotment Associations and similar organisations are asked to communicate their names and addresses to the Director of Horticulture, Food Production Department, 72, Victoria Street, London, S.W. 1.

Gardens in War Time.

THE following suggestions have been drawn up with a view to helping those who are inexperienced in gardening :—

1. Vegetables should be grown instead of flowers, or at most only a small part should be devoted to flowers.

2. A small part of the garden, a warm corner well drained but not heavily manured, should be set aside for the purpose of seed saving.

Sow in this garden say, one dozen or more seeds of each of the following :—Scarlet runners, dwarf beans and haricot beans. Scarlet runners may be grown without stakes or poles. Sow the seed 2 ft. apart each way, and as soon as the point (the curling tip which makes the twining stem) is visible, pinch it out and similarly pinch out any branches which later on show signs of running. Do not pick any of the pods for eating purposes. When the pods are thoroughly ripe and beginning to turn yellow, pull up the plants and hang them in bundles in a warm, dry place. As soon as the pods are thoroughly dry they may be shelled, any bad seeds thrown away, and the good seeds spread on sheets of brown paper in a warm (but not hot), dry place. As soon as the pods are thoroughly dry they should be placed in paper bags or in seed packets, and kept in a cool, dry room.

3. To test germination of seed to be sown, place moistened, but not wet pieces of flannel or blotting paper in two saucers. Place in one of the saucers 20 or more seeds which have been soaked in water overnight Cover the saucer containing the seed with the other and place it in a warm room, taking care, however, that the flannel or other material does not get dry. Inspect daily, and as soon as a seed shows its root remove it, and after a time, varying according to the different seeds from a week or a fortnight, work out the percentage of germination. If the sample seeds have germinated well the remainder should be kept for next year.

Seed left over from last year should be tested and used in preference to this year's seed if it germinated fairly well.

4. All gardeners should exercise economy in seed sowing. Many gardeners sow seed too thickly. Seed is precious now and no more should be sown than is necessary. Before sowing, the number of plants required for the ground may usefully be estimated. A good rule is to sow no more than twice as many seeds as the number of plants required, although in the case of seeds which do not long retain their powers of germination (parsnips for instance), rather more should be sown.

5. Seed liable to be eaten by mice or birds should be moistened, rubbed in powdered red lead (a poison), and then planted.

6. Late summer sowing should be practised, and a good breadth of garden beet should be sown in the latter part of July or at the beginning of August, for winter use.

7. If expert advice is required and cannot be obtained locally, apply to The Secretary, Food Production Department, 72, Victoria Street, London, S.W. 1.

8. Any surplus which may be produced should not be wasted. Advice and assistance as to the disposal and preservation of surplus produce may be obtained on application to the Food Production Department if not available locally.

If advice on this and other subjects is required, it would be useful to ascertain first whether neighbouring allotment associations or other small cultivators require assistance also, so that a joint application for advice may be made, thus economising the time of the adviser who may be sent.

9. Onions and carrots should not be sown on freshly turned-up land.

10. Soot or lime dusted along the rows will help to keep down slugs.

11. Strands of black cotton stretched along the rows will protect seedlings from birds.

12. The tips of broad beans should be pinched out when the plants are about 2 ft. high, in order to lessen the effect of attack by aphis (black fly).

13. If space is limited and it is desired to use a lawn without destroying the grass, turves 1 ft. square may be taken out at intervals of 3 ft. The ground should be broken up with a fork, a little well-rotted manure added, and the surface raked, after which climbing French beans may be sown. When the seedlings appear, they should be staked. After the crop is gathered the turves may be replaced (these should have been laid in any convenient part of the garden), and in a month or two the lawn will be as good as ever.

14. Neighbouring gardeners should co-operate in making provision for the spraying of potatoes.

Food Production by School Children.

AN excellent scheme for food production by school children has been put in operation at Abergavenny.

Land to the extent of 24 acres has been rented, and practically every child in the higher departments of the public elementary schools has taken a row, 100 yards long, paying 7*s.*, the estimated expenses, by 28 weekly instalments of 3*d.*

The childen are expected to set the potatoes, clear the rows

before moulding, lift and pick the crop, and put it in bags; all other work, such as manuring, ploughing, moulding, and haulage into the town being done by the organisers.

1,100 rows have been taken under the scheme, and it is estimated that the average yield of potatoes per row will be 2¼ cwt., and that the children's payments will cover the cost of seed, manure, labour, and the rent of the land.

WHEN peas are sown thinly it is very important that every precaution should be taken to safeguard the seeds against the depredations of birds and mice.

Protection of Peas from Birds and Mice.

The following methods of protection have been adopted with success :—

(1) Place the peas in a flower-pot after the central hole has been corked. Sprinkle the seeds with a very little pure paraffin to moisten them slightly, and apply a little red lead; if the flower-pot is then shaken the seeds will become completely coated with the red lead, and can be planted at once.

(2) Place 1 lb. of peas in a quart of water in which 1 oz. of bitter aloes* has been dissolved. Allow to stand for from 12–24 hours or longer according to the hardness of the peas. When the solution has been absorbed, the seeds are ready to plant and will be unpalatable to birds and mice.

(3) Peas may be sprayed with soapy water and bitter aloes if attacked by birds during the early stages of growth.

* Bitter aloes may be obtained at present at from 1*s.* to 1*s.* 3*d.* per lb. In smaller quantities they would probably be obtained from chemists at 3*d.* per oz.

NAMES AND ROUTES OF THE SUPER, KING'S AND BOARD'S PREMIUM STALLIONS.

Particulars of the Routes of the Stallions to which Premiums have been awarded by the Board for the Service Season 1917, together with the names and addresses of the owners of the Stallions, and of the members of the Stallion Committees which have been appointed to supervise the service arrangements, are given below. The Routes are subject to some alteration by arrangement between the owners and the Stallion Committees.

The District Classes for England and Wales are as follow:—

District Class.	Counties.	Number of Premium Stallions.	
		King's and Super.	Board's.
1	DURHAM	1	1
	NORTHUMBERLAND	2	—
	YORK, N. RIDING	2	3
2	CUMBERLAND	1	—
	LANCASTER	—	—
	WESTMORLAND	1	—
3	YORK, E. RIDING	4	—
	,, W. RIDING	3	3
4	LINCOLN, Parts of HOLLAND ..	—	—
	,, ,, KESTEVEN ..	1	—
	,, ,, LINDSEY ..	—	2
	NOTTS	2*	—
5	DERBY	1	1
	STAFFORD	1	1
6	CHESTER	1	—
	HEREFORD	1	2
	SALOP	1	2
7	ANGLESEY	1	—
	BRECKNOCK	—	—
	CARDIGAN	—	—
	CARMARTHEN	1	—
	CARNARVON	—	—
	DENBIGH..	—	—
	FLINT	—	—
	GLAMORGAN	1	—
	MERIONETH	—	—
	MONMOUTH	—	1
	MONTGOMERY	1	1
	PEMBROKE	1	1
	RADNOR	—	—

* Of which one stallion travels also in Kesteven.

District Class.	Counties.	Number of Premium Stallions.	
		King's and Super.	Board's.
8	GLOUCESTER	2	1
	OXFORD	—	1
	WARWICK	3	—
	WORCESTER	1	2
9	BEDFORD	1	—
	HUNTS	1	—
	LEICESTER	1	1
	NORTHAMPTON	2	1
	RUTLAND	—	1
	SOKE OF PETERBORO'	—	—
10	CAMBS	—	—
	ISLE OF ELY	—	—
	NORFOLK	2	2
	SUFFOLK	1	2
11	BUCKS	1	—
	ESSEX	2	—
	HERTS	—	1
	MIDDLESEX	—	—
12	KENT	1	1
	SURREY	1†	—
	SUSSEX, EAST	1	—
	,, WEST	1	1*
13	BERKS	2	—
	HANTS	1	2
	ISLE OF WIGHT	—	1
14	DORSET	1	1
	SOMERSET	3	1
	WILTS	2	—
15	CORNWALL	1	1
	DEVON	2	2
	Totals	60	40

* Travels also in Surrey. † Travels also in Sussex (East).



Copyright.] [*W. A. Rouch.*

FIG. 1.—**Rathurde.**—Winner of the King's Champion Challenge Cup at the Show of Thorough-bred Stallions, held at the Royal Agricultural Hall, Islington, on 28th February, 1917.

Owner.—Captain T. L. Wickham-Boynton, Burton Agnes Stud, Driffield, Yorks.



Copyright.] [*W. A. Rouch.*

FIG. 2.—**Gilgandra.**—Reserve to Winner of the King's Champion (photo above).

Owners.—The Compton Stud, Sandley, Gillingham, Dorset.

DISTRICT CLASS 1.

Durham, Northumberland, and York (North Riding).
5 King's Premiums and 4 Board's Premiums.

DURHAM.

Maître Corbeau (King's Premium).
Owners :—Capt. T. L. Wickham-Boynton and Mr. H. A. Cholmondeley, Burton Agnes, Driffield.
Route :—Bishop Auckland, Sedgefield, Stockton, Wolviston, Elwick, Trimdon, Wingate, and Ferry Hill.
Committee :—
Mr. A. L. Greenwell, Windlestone, Ferry Hill.
Mr. S. Menzies, East Close Farm, Sedgefield, Ferry Hill.
Mr. R. Ord, Sands Hall, Sedgefield, Ferry Hill.
Mr. R. Watson, Long Newton, Stockton-on-Tees.

Désespoir (Board's Premium).
Owner :—Mr. F. Brownless, Hutton Henry, Castle Eden, Co., Durham.
Route :—Shotton Colliery, Haswell, Easington, Murton, Hetton-le-Hole, Houghton-le-Spring, Durham, Shincliffe, Cassop, Wheatley Hill, Hesledon, and West Hartlepool.
Committee :—
Mr. B. Brough, Seaton, near Seaham Harbour, Co. Durham.
Mr. W. M. Carr, Manor House, Easington Village, Co. Durham.
Mr. M. Clark, Pittington Hallgarth, Durham.
Mr. G. H. Forster, Biddick Hall, Fence Houses.
Mr. J. Murray, Pesspool Hall, Haswell, Sunderland.

NORTHUMBERLAND.

Darigal (Super Premium).
Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Alnwick, Warnford, Doddington, Pallinsburn, Wooler, and Powburn.
Committee :—
Mr. B. Clayhills, Estates Office, Callaley, Whittingham, Northumberland.
Mr. A. Fawcus, Louth Charlton Farm, Alnwick.
Mr. J. Patten, The Park Farm, Alnwick.
Mr. G. G. Rea, Doddington, Wooler, Northumberland.

Denis Richard (King's Premium).
Owner :—Mr. C. T. Maling, Haydon Kennels, Haydon Bridge, Northumberland.
Route :—Haydon Bridge, Wark, Barrasford, Stamfordham, Blaydon, Riding Mill, and Hexham.
Committee :—
Mr. A. M. Allgood, Walwick Grange, Humshaugh.
Mr. J. L. Heppell, Whorlton House, Westerhope, Newcastle-on-Tyne.
Mr. C. H. Sample, Shildon Grange, Corbridge.
Mr. J. O. Scott, Riding Mill, Northumberland.
Mr. A. C. Spraggon, Willimoteswyke Castle, Bardon Mill.

YORK (NORTH RIDING).

Crathorne (King's Premium).

Owner :—The Lord Middleton, Birdsall, Malton.

Route :—Birdsall, Malton, Hovingham, Gilling, Coxwold, Easingwold, Clifton, Strensall, Sheriff Hutton, and Terrington.

Committee :—
Mr. H. Hawking, Avondale, Easingwold.
Mr. E. Parsons, Estate Office, Birdsall, Malton.
Mr. S. A. Payne-Gallwey, Brandsby Lodge, Easingwold.
Mr. J. Wood, East Lilling Grange, Flaxton, York.

Renown (King's Premium).

Owners :—The Compton Stud, Sandley, Gillingham, Dorset.

Route :—Langton Hall, Thirsk, Bedale, Northallerton, Croft Spa, and Scotch Corner.

Committee :—
Mr. J. F. Baker-Baker, East Hall, Middleton Tyas, Yorks.
Mr. T. Clark, Winton House, Northallerton.
Mr. E. H. Courage, The Hall, Kirkby Fleetham, Bedale.

Flying Scot (Board's Permium).

Owner :—Mr. W. Walton, Callais House, Rectory Lane, Guisborough.

Route :—Guisborough, Loftus, Brotton, Saltburn, Redcar, Middlesbrough, Thornaby, Yarm, Stokesley, and Nunthorpe.

Committee :—
Mr. J. Hutchinson, Bank House, Guisborough.
Mr. S. Morton, M.R.C.V.S., Middlesbrough.

Jovial (Board's Premium).

Owner :—The Lord Middleton, Birdsall, Malton.

Route :—Pickering, Salton, Normanby, Nunnington, Helmsley, Kirbymoorside, Snainton, and Seamer.

Committee :—
Mr. A. Pearson, Helmsley, Yorks.
Mr. J. Peters, Duncombe Park Estate Office, Helmsley, Yorks.
Mr. H. P. Webster, Abbey Farm, Yedingham, West Heslerton, Yorks.

Kelso (Board's Premium).

Owners :—Messrs. T. & H. Ward, Pinchinthorpe, Guisborough, Yorks.

Route :—Pinchinthorpe, Hutton, Loftus, Staithes, Lythe, Egton, Castleton, and Little Ayton.

Committee :—
Mr. T. S. Petch, Liverton, Loftus-in-Cleveland.
Mr. G. Rhea, Limber Hill, Glaisdale, Grosmont.
Mr. J. H. Tyerman, Pond Farm, Hinderwell.

DISTRICT CLASS 2.

Cumberland, Lancaster, and Westmorland.
2 King's Premiums.

CUMBERLAND.

Lord Harry (King's Premium).
Owner :—The Earl of Lonsdale, Barley Thorpe, Oakham.
Route :—Lowther, Penrith, Carlisle, Brampton, Aspatria, and Cockermouth.
Committee :—
Mr. G. M. Bell, 1, Lonsdale Street, Carlisle.
Mr. R. E. James, Manor House, Oughterside, Aspatria.
Mr. R. Robinson, Estate Office, Lowther, Penrith.

WESTMORLAND AND LANCASTER.

Tates (King's Premium).
Owner :—Mr. Ralph Rimmer, 52, Stramongate, Kendal.
Route :—Kendal, Windermere, Ulverston, Cartmel, Milnthorpe, Carnforth, and Kirkby Lonsdale.
Committee :—
Mr. A. Hoggarth, Midland Bank Chambers, Kendal.
Dr. E. S. Jackson, Robin Hill, Carnforth.
Mr. W. S. Ridehalgh, Broughton Lodge, Grange-over-Sands.
Mr. G. G. Robinson, Underley Farm, Kirkby Lonsdale.
Mr. J. Towers, Camp House, Hornby, Lancaster.

DISTRICT CLASS 3.

York (East and West Ridings).
7 King's Premiums and 3 Board's Premiums.

YORK (EAST RIDING).

Birk Gill (Super Premium).
Owners :—Capt. T. L. Wickham-Boynton and Mr. H. A. Cholmondeley, Burton Agnes, Driffield.
Route :—Burton Agnes, Swine, Coniston, Preston, Nuthill, Withernwick, Aldbrough, Skirlaugh, Brandesburton, and Beeford.
Committee :—
Mr. F. Reynard, Sunderlandwick, Driffield.
Mr. T. Robinson, Nuthill, Preston, Hull,
Mr. G. Whiting, Estate Office, Burton Agnes, Driffield.

Rathurde (Super Premium and Winner of the King's Champion Challenge Cup).
Owner :—Capt. T. L. Wickham-Boynton, Burton Agnes, Driffield.
Route :—Burton Agnes, Driffield, Bainton, Middleton, Cherry Burton, Bishop Burton, Beverley, Lockington, Cranswick, Frodingham and Kelk.
Committee :—
Mr. F. Reynard, Sunderlandwick, Driffield.
Capt. J. J. Ridley, M.R.C.V.S., Osborne House, Beverley.
Mr. G. Whiting, Estate Office, Burton Agnes, Driffield.

San Stefano (King's Premium).
Owner :—Capt. T. L. Wickham-Boynton, Burton Agnes, Driffield.
Route :—Burton Agnes, Carnaby, North Burton, Hunmanby, Flixton, Ganton, Sherburn, West Hesleton, Weaverthorpe, Langtoft, and Kilham.
Committee :—
Mr. J. S. Chubb, Sledmere, Malton.
Mr. J. Cranswick, The Howe, Hunmanby, Yorks.
Mr. G. Whiting, Estate Office, Burton Agnes, Driffield.

Tantamount (King's Premium).
Owner :—The Lord Middleton, Birdsall, Malton.
Route :—Birdsall, Stamford Bridge, Escrick, Bubwith, Wressle, Howden, North Cave, Newbald, Market Weighton, Pocklington, and Bishop Wilton.
Committee :—
Mr. E. Parsons, Birdsall, Malton.
Mr. C. W. Thompson, Red House, Escrick, York.
Lieut.-Col. The Hon. T. Willoughby, Howsham Hall, York.

YORK (WEST RIDING).

Adeodatus (King's Premium).
Owners :—Messrs. E. & P. Hodgson, Riding Fields Stud, Beverley.
Route :—Selby, Snaith, Goole, Thorne, Doncaster, Monk Fryston, and Haddlesey.
Committee :—
Mr. M. Beaumont, Wood Farm, Whitley Bridge.
Mr. J. S. Johnson, Hook House, Near Goole.
Mr. J. Milner, Norton Priory, Doncaster.

Bachelor's Lodge (Super Premium).
Owners :—Capt. T. L. Wickham-Boynton and Mr. H. A. Cholmondeley, Burton Agnes, Driffield.
Route :—Acomb, Tadcaster, Shadwell, Harewood, Boston Spa, Tockwith, Moor Monkton, and Poppleton.
Committee :—
Mr. C. E. C. Cass, Springwell, Kirk Hammerton, York.
Mr. B. Day, The Rookery, Chapel Allerton, Leeds.
Mr. F. Myers, Grange Farm, Bilbrough, York.

Forcett (King s Premium).
Owner :—Mr. John Lett, Rillington, York.
Route :—Wetherby, Harrogate, Knaresborough, Ripon, Boroughbridge, Otley, and Ripley.
Committee :—
Mr. T. A. Hudson, Rudding House, Pannal, Harrogate.
Mr. B. North, 31, Market Place, Ripon.
Mr. T. Robinson, The Laurels, Wetherby.

Cavour (Board's Premium).
Owners :—Messrs. T. & H. Ward, Pinchinthorpe, Guisborough, Yorks.
Route :—Ilkley, Bradford, Bingley, Shipley, Keighley, Skipton, Gisburn, and Hellifield.
Committee :—
Mr. A. Dewhirst, Park Farm, Eccleshill, Bradford.
Mr. H. Dewhurst, Aireville, Skipton, Yorks.
Mr. J. H. Starkie, Estate Office, Gisburn, Clitheroe.

Ethelbruce (Board's Premium).
Owner :—Mr. T. Carr, Station Road, Selby.
Route :—Sprotborough, Melton, Maltby, Bawtry, Rossington, Wistow Lordship, Cawood, Acaster Selby, Aberford, and South Milford.
Committee :—
Mr. J. Cooke, Melton-on-the-Hill, Doncaster.
Mr. T. Frost, The Poplars, Bawtry, Yorks.
Mr. D. Greenwood, Little Fenton, Leeds.
Mr. J. Wilde, Wistow, Selby, Yorks.

G. P. (Board's Premium).
Owner :—Dr. A. O. Haslewood, Fairfield Stud, Buxton.
Route :—Barnsley, Billingley, Upton, Hampole, Kirk Smeaton, Whitley Bridge, Knottingley, Pontefract, Royston, Clayton West, and Penistone.
Committee :—
Mr. W. Sheard, Clayton West, Huddersfield.
Dr. E. J. H. Sullivan, South Kirkby, Wakefield.
Mr. C. Howard Taylor, Middlewood Hall, Darfield, Barnsley.
Mr. H. S. Tommasson, Plumpton, Penistone.

DISTRICT CLASS 4.

Lincoln (Holland, Kesteven, and Lindsey) and Notts.
3 King's Premiums and 2 Board's Premiums.

LINCOLN (KESTEVEN).

Top Covert (King's Premium).
Owners :—The Exors. of the late F. Hardy, Staunton Hall Stud, Orston, Nottingham.
Route :—Rauceby, Sleaford, Welbourn, Hougham, Manthorpe, Honington, and Folkingham.
Committee :—
Mr. P. Brown, Dorrington, Lincoln.
Mr. C. T. Marriner, Rowston Manor, Lincoln.
Mr. C. Woods, Manthorpe, Grantham.

LINCOLN (LINDSEY).

Last Night (Board's Premium).
Owner :—Mr. C. J. C. Hill, Hemswell, Lincoln.
Route :—Glentworth, Torksey, Lincoln, Brigg, and Wootton.
Committee :—
Mr. F. A. Holmes, M.R.C.V.S., Hemswell, Lincoln.
Mr. W. B. Swallow, Wootton Lawn, Ulceby, Lincs.
Mr. H. C. Tong, Office of the County Council, Mint Street, Lincoln.

Monkey Tricks (Board's Premium).
Owners :—The Southwold Hunt Sire Association, Claythorpe Manor, Alford.
Route :—Alford, Spilsby, Louth, Brocklesby, and Horncastle.
Committee :—
Mr. H. D. Addey, Claythorpe Manor, Alford.
Mr. E. Crowder, Langton Manor, Horncastle.
Mr. B. Rowland, Wainfleet St. Mary, Lincs.

NOTTS.

Indian Runner (King's Premium).

Owner :—Lieut.-Colonel R. L. Birkin, D.S.O., Edale House, The Park, Nottingham.

Route :—Radcliffe-on-Trent, Tollerton, Cotgrave, East Bridgford, Southwell, Hockerton, Fledborough, Tuxford, Ollerton, Mansfield, and Nottingham.

Committee :—

Mr. T. Ellerby, Fledborough, Newark.
Mr. H. W. T. Patterson, The Repository, Parliament Street, Nottingham.
Mr. F. O. Thurman, Welldale, East Leake, Loughborough.
Mr. F. B. Wilkinson, Cavendish Lodge, Edwinstowe, Newark.

KESTEVEN AND NOTTS.

Take Care (King's Premium).

Owner :—Mr. R. L. Fenwick, Little Belvoir, Melton Mowbray.

Route :—Bingham, Newark, Grantham, Corby, and Buckminster.

Committee :—

Mr. W. Newton, Barrowby Old Hall, Grantham.
Mr. O. Quibell, Shalem Lodge, Newark.
Mr. J. E. Thurman, Corby Birkholme, Grantham.

DISTRICT CLASS 5.

Derby and Stafford.
2 King's Premiums and 2 Board's Premiums.

DERBY.

Fitz Richard (King's Premium).

Owner :—Dr. A. O. Haslewood, Fairfield Stud, Buxton.

Route :—Buxton, Bakewell, Ashbourne, Uttoxeter, Sudbury, and Derby.

Committee :—

Mr. T. H. L. Duckworth, M.R.C.V.S., Ashbourne.
Messrs. Hampson Bros., 3, The Quadrant, Buxton.
Major F. W. Peacock, Vernons Oak, Somersall Herbert, Derby.

Clear Spring (Board's Premium).

Owner :—Dr. A. O. Haslewood, Fairfield Stud, Buxton.

Route :—Buxton, Foolow, Bamford, Hathersage, Greenhill, Chesterfield, Ashover, Matlock Green, Wirksworth, Youlgreave, and Chelmorton.

Committee :—

Rev. J. B. Nodder, Ashover Rectory, Chesterfield.
Mr. W. Tinsley, Rookery, Ashford, Bakewell.
Mr. W. Wilson, M.F.H., Horsley Gate Hall, Holmesfield, Sheffield.

STAFFORD.

Sysonby (King's Premium).

Owners :—Messrs. J. F. Rees and W. V. Howell Thomas, 22, Lammas Street, Carmarthen.

Route :—Madeley, Newcastle, Stone, Rugeley, Lichfield, Penkridge, Stafford, Eccleshall, and Whitmore.

Committee :—

Mr. R. Carless, M.R.C.V.S., Stafford.
Mr. H. Toon, Greenhill, Norton Bridge, Stone.
Mr. R. S. Wilkinson, Swinchurch, Newcastle, Staffs.
Mr. H. J. C. Winterton, Lichfield.
Mr. E. Woodcock, M.R.C.V.S., Eccleshall, Stafford.

St. Fagans (Board's Premium).

Owners :—Messrs. J. F. Rees and W. V. Howell Thomas, 22, Lammas Street, Carmarthen.

Route :—Alstonfield, Waterhouses, Basford, Cheddleton, Leek, Endon, Hanley, Longton, Cheadle, and Snelston.

Committee :—

Mr. T. Beswick, Alstonfield, Ashbourne.
Dr. Hall, Waterhouses, near Leek.
Mr. P. Hammersley, Derby Street, Leek.

DISTRICT CLASS 6.

Chester, Hereford, and Salop.
3 King's Premiums and 4 Board's Premiums.

CHESTER.

Rays Cross (King's Premium).

Owner :—Mr. L. Cookson, Bryn-y-grog, Wrexham.

Route :—Tarporley, Bunbury, Nantwich, Crewe, Sandbach, Middlewich, Minshull Vernon, Over, Northwich, Chester, and Tarvin.

Committee :—

The Rev. J. H. Armitstead, The Vicarage, Holmes Chapel.
The Rev. Canon J. R. Armitstead, The Vicarage, Sandbach.
Sir Gilbert Greenall, Bart., C.V.O., Walton Hall, Warrington.
Mr. E. C. Griffiths, Broken Cross, Northwich.
Mr. J. W. Macfie, Rowton Hall, Chester.
Mr. G. Norris Midwood, The Grange, North Rode, Congleton.
Mr. C. E. Parton, Haughton Hall Farm, Tarporley.
Mr. B. D. Poole, Marbury Hall, Whitchurch, Salop.

HEREFORD.

Elector (King's Premium).

Owner :—Mr. A. McMahon, Corbally House, Ballylinan, Queen's County, Ireland.

Route :—Hereford, Ledbury, Ross, Leominster, and Bromyard.

Committee :—

Mr. J. Bird, Livers Ocle, Hereford.
Mr. C. Addison Hall, 34, Etnam Street, Leominster.
Capt. T. R. Symons, The Mynde Park, Hereford.

Spey Royal (Board's Premium).
Owner :—Mr. J. B. Dowding, Fairfield, Leominster.
Route :—Fairfield (Leominster), Leintwardine, Titley, Edvin Ralph, and Brimfield.
Committee :—
Mr. H. R. Evans, Court of Noke, Pembridge, Herefordshire.
Mr. C. Addison Hall, 34, Etnam Street, Leominster.
Capt. E. L. Heygate, Buckland, Leominster.

* **The Doctor** (Board's Premium).
Owner :—Mr. J. B. Dowding, Fairfield, Leominster.
Route :—Fairfield (Leominster), Hay, Peterchurch, Blakemere, Tibberton, Madley, and Pyon.
Committee :—
Mr. A. E. Goodwin, Wilmastone, Peterchurch, Hereford.
Mr. Roger Haines, Snodhill, Peterchurch, Hereford.
Mr. C. Addison Hall, 34, Etnam Street, Leominster.

SALOP.

Neyland (King's Premium).
Owner :—Colonel Henry Heywood-Lonsdale, Shavington, Market Drayton.
Route :—Bridgnorth, Much Wenlock, and Corvedale district.
Committee :—
Mr. W. Bishop, Posenhall, Broseley, Salop.
Mr. Blatherwick, Wrixton Manor, Burwarton, Bridgnorth.
Mr. B. Butcher, Eardington, Bridgnorth.
Mr. H. W. Fell, Shavington Grange, Market Drayton.

Jack Scarlett (Board's Premium).
Owner :—Colonel Henry Heywood-Lonsdale, Shavington, Market Drayton.
Route :—Market Drayton, High Ercall, Shrewsbury, Oswestry, Ellesmere, and Whitchurch.
Committee :—
Mr. H. W. Fell, Shavington Grange, Market Drayton.
Mr. R. Hughes, F.R.C.V.S., Oswestry.
Mr. A. Mackenzie, F.R.C.V.S., Market Drayton.
Mr. H. Mason, Kynnersley Manor, Wellington.

Sea Flier (Board's Premium).
Owner :—Major David Davies, M.P., M.F.H., Broneirion, Llandinam, Montgomeryshire.
Route :—Ludlow, Bishop's Castle, Chirbury, Worthen, Pontesbury, Dorrington, Leebotwood, Church Stretton, and Craven Arms.
Committee :—
Mr. C. E. Dayus, M.R.C.V.S., Coton House, Craven Arms, Salop.
Mr. G. Edwards, The Offices, Llandinam, Mont.
Mr. W. Kilvert, New House, Lydbury North, Salop.
Mr. C. Price, Leigh Hall, Minsterley, Salop.
Mr. T. Whitfield, 12, Talbot Chambers, Shrewsbury.
Mr. H. E. Whittaker, M.F.H., Ludford Park, Ludlow.

* Hunter Stallion.

DISTRICT CLASS 7.

Counties of Wales.
5 King's Premiums and 3 Board's Premiums.

ANGLESEY.

Sanglamore (King's Premium).
Owners :—Messrs. J. F. Rees, and W. V. Howell Thomas, 22, Lammas Street, Carmarthen.
Route :—Tynygongl, Rhosgoch, Llanerchymedd, Llangefni, Bodorgan, Ty Croes, Valley, Llanfair, and Beaumaris.
Committee :—
Mr. J. Coulthard, Baron Hill Home Farm, Beaumaris.
Mr. W. H. Jones, Fferam Rhosydd, Bodorgan.
Mr. W. H. Owen, Fferam Paradwys, Bodorgan.
Mr. O. Trevor Williams, Llangefni.

CARMARTHEN.

Scipio (King's Premium).
Owners :—Messrs. J. F. Rees and W. V. Howell Thomas, 22, Lammas Street, Carmarthen.
Route :—Carmarthen, Nantcaredig, Llanarthney, St. Clears, Whitland, Llanboidy, and Mydrim.
Committee :—
Mr. E. Jones, Manoravon, Llandilo, Carmarthenshire.
Mr. D. H. Thomas, Starling Park, Carmarthen.

GLAMORGAN.

Jingling Geordie (King's Premium).
Owner :—Mr. J. Staien, Coed Hills Stud Farm, St. Hilary, Cowbridge.
Route :—Cowbridge, Llantwit Major, Rhoose, St. Fagans, Tongwynlais, Caerphilly, Abercynon, Pontypridd, Llantrissant, Wick, Bridgend, and Pencoed.
Committee :—
Mr. E. T. Lloyd, Llantwit Major, Cardiff.
Mr. I. Williams, Castleton, St. Athan, Cardiff.
Mr. R. H. Williams, M.F.H., The Ham, Llantwit Major, Cardiff.

MONMOUTH.

* **Alha II.** (Board's Premium).
Owner :—Mr. A. M. Pilliner, Llanyravon, Near Newport, Mon.
Route :—Llanyravon, Pontypool, Goytre, Abergavenny, Penpergwm, Usk, Chepstow, Caerwent, Magor, Llanwern, and Caerleon.
Committee :—
Mr. A. G. Burchardt-Ashton, Llandogo Priory, Chepstow.
Mr. C. B. Knight, Llanvihangel Court Farm, Roggiett, Newport, Mon.
Mr. A. M. Pilliner, Llanyravon, Newport, Mon.

* Hunter Stallion.

MONTGOMERY.

Great Surprise (Super Premium).

Owner :—Major David Davies, M.P., M.F.H., "Broneirion," Llandinam, Montgomery.

Route :—Llandinam, Newtown, Sarn, Montgomery, Forden, Welshpool, Pool Quay, Llanymynech, Garthmyl, and Abermule.

Committee :—

Mr. T. Green, The Bank, Pool Quay, Welshpool.
Capt. C. M. S. Humphreys, Garthmyl Hall, Garthmyl, Mont.
Mr. E. C. Morgan, Crown Chambers, Newtown.
Mr. R. Morgan, Snowfield, Kerry, Newtown.

* **Ballinasloe** (Board's Premium).

Owner :—Major David Davies, M.P., M.F.H., "Broneirion," Llandinam, Montgomery.

Route :—Manafon, Llanfair, Meifod, Llanfyllin, Llangedwyn, Llansantffraid, Guilsfield, Buttington, Churchstoke, and Berriew.

Committee :—

Mr. T. Green, The Bank, Pool Quay, Welshpool.
Capt. C. M. S. Humphreys, Garthmyl Hall, Garthmyl, Mont.
Mr. E. C. Morgan, Crown Chambers, Newtown.
Mr. R. Morgan, Snowfield, Kerry, Newtown.

PEMBROKE.

Just Cause (King's Premium).

Owner :—Mr. J. Griffiths, Jameston Court, Manorbier, Pembs.

Route :—Haverfordwest, South Row, Pembroke, Cresselly, Templeton, and Narberth.

Committee :—

Mr. J. Gibbon, Vaynor, Narberth, Pembs.
Mr. G. D. Llewellyn, Stephens Green, Milton, Pembroke.
Mr. T. G. Phelps, Cresselly, Begelly, Pembs.

Barbed Fence (Board's Premium).

Owner :—Mr. J. Griffiths, Jameston Court, Manorbier, Pembs.

Route :—Narberth, Clynderwen, Boncath, Clynfiew, Newport, Fishguard, Letterston, St. Davids, Camrose, and Haverfordwest.

Committee :—

Mr. G. B. Bowen, Llwyngwair, Newport, Pembs.
Mr. V. J. G. Johns, Fishguard.
Mr. T. E. Lewis-Bowen, Clynfiew, Boncath, Pembs.

DISTRICT CLASS 8.

Gloucester, Oxford, Warwick, and Worcester.
6 King's Premiums and 4 Board's Premiums.

GLOUCESTER.

Gilgandra (Super Premium).

Owners :—The Compton Stud, Sandley, Gillingham, Dorset.

Route :—Cirencester, Fairford, Burford, Kingham, Lower Slaughter, and Northleach.

Committee :—

Mr. P. Barnett, 4, Bromley Terrace, Cirencester.
Mr. E. T. Prichard, Donnington Manor, Moreton-in-Marsh, Glos.
Mr. A. Rixon, Turkdean Manor, Northleach, Glos.

* Hunter Stallion.

John Lambton (Super Premium).
Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Berkeley Road, Stroud, Tetbury, and Yate.
Committee :—
Mr. J. Pearce Ellis, Maisemore Court, Gloucester.
Colonel F. Henry, Elmstree, Tetbury, Glos.
Mr. A. Miller, Badminton, Glos.

Sandow (Board's Premium).
Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Gloucester, Newent, Tewkesbury, Winchcombe, and Cheltenham.
Committee :—
Mr. Granville Acworth, The Hill Ash, Dymock, Glos.
Mr. H. Dent-Brocklehurst, Sudeley Castle, Winchcombe, Glos.
Mr. J. Gibbons, Boddington Manor, Cheltenham.

OXFORD.

Toyshop (Board's Premium).
Owner :—Mr. J. Mumford, Stud Farm, Knightcote, Leamington Spa.
Route :—Oxford, Woodstock, Bicester, Witney, Charlbury, and Heyford.
Committee :—
Mr. R. K. McPherson, Randolph Hotel Stables, Oxford.
Mr. G. Mansfield, Spring Hill House, Hethe, Bicester.
Mr. B. W. Millington, Deddington, Oxford.

WARWICK.

Newmarket (King's Premium).
Owner :—Lord Willoughby de Broke, Compton Verney, Warwickshire.
Route :—Kineton, Wellesbourne, Hampton Lucy, Stratford-on-Avon, Oxhill, Fenny Compton, and Radway.
Committee :—
Lord Willoughby de Broke, Compton Verney, Warwickshire.
Mr. C. Kendal, Mount Pleasant, Walton, Warwick.
Mr. J. Lea, Charlecote, Warwick.
Mr. J. Wilkes, Tredington, Shipston-on-Stour.

Soft Answer (King's Premium).
Owner :—Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwick.
Route :—Southam, Shuckburgh, Dunchurch, Rugby, Pailton, Brinklow, Brandon, Offchurch, and Ufton.
Committee :—
Mr. J. Ashburner, Brandon, near Coventry.
Mr. J. B. Johnson, Manor House, Willoughby, Rugby.
The Hon. C. Portman, Goldicote, Statford-on-Avon.
Mr. E. Ringer, M.R.C.V.S., Guy Street, Leamington Spa.

The Tailor (King's Premium).
Owner :—Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwick.
Route :—Nuneaton, Coleshill, Stonebridge, Knowle, Hockley Heath, Beoley Cross, Henley-in-Arden, Kenilworth, and Warwick.
Committee :—
Mr. J. P. Arkwright, Hatton House, Warwick.
Mr. T. M. Burman, Bragg's Farm, Shirley, near Birmingham.

WORCESTER.

Puro Caster (King's Premium).

Owner :—Lord Willoughby de Broke, Compton Verney, Warwickshire.

Route :—Worcester, Droitwich, Bromsgrove, and Redditch.

Committee :—

Major J. Baldwin, Alvechurch, Birmingham.
Mr. R. Cottrill, Sandal Lodge, Droitwich.
Mr. A. Jones, Ombersley, Droitwich.
Colonel W. Stallard, Worcester Chambers, Pierpoint Street, Worcester.

Comic Charlie (Board's Premium).

Owner :—Mr. T. J. Hillman, Stud Farm, Stock Wood, Redditch, Worcestershire.

Route :—Inkberrow, Wesham, Pershore, Birlingham, Kempsey, Spetchley, and Upton Snodsbury.

Committee :—

Colonel A. H. Hudson, Wick House, Pershore, Worcester.
Mr. G. Dudley Smith, Strensham Court, Worcester.
Mr. Ernest Tipping, Inkberrow, Worcester.

Jeremiah (Board's Premium).

Owner :—Mr. W. P. Pope, Brockamin, Leigh, Worcester.

Route :—Leigh, Knightwick, Suckley, Malvern, Hanley Castle, Upton-on-Severn, Madresfield, Powick, and district.

Committee :—

Mr. W. J. Gusson, M.F.H., Severn Stoke, Worcester.
Mr. G. Dudley Smith, Strensham Court, Worcester.
Mr. T. Lawson Walker, Knightwick Manor, Worcester.

DISTRICT CLASS 9.

Bedford, Hunts, Leicester, Northampton, Rutland, and Soke of Peterborough.
5 King's Premiums and 3 Board's Premiums.

BEDFORD.

Sundawn (King's Premium).

Owner :—Mr. D. Fraser, Tickford Park, Newport Pagnell.

Route :—Moulsoe, Cranfield, Kempston, Bromham, Harrold, Thurleigh, Great Barford, Biggleswade, Broom, Shefford, Sharpenhoe, and Woburn.

Committee :—

Mr. G. E. Brown, Marston Moretaine, Ampthill.
Mr. B. Howkins, Bromham, Bedford.
Mr. H. King, Broom, Biggleswade.
Mr. J. C. H. Robinson, Marsh Leys, Kempston, Bedford.
Mr. S. Seymour, "The Lodge," Ampthill.

HUNTS.

Bachelor's Charm (Super Premium).

Owner :—Major David Davies, M.P., M.F.H., "Broneirion," Llandinam, Mont.

Route :—Huntingdon, St. Ives, Somersham, Pidley, Ramsey, Alconbury, St. Neots, Staughton, and Ellington.

Committee :—

Mr. A. G. Dilley, Market Hill, Huntingdon.
Mr. E. J. Francis, Alconbury House Farm, Huntingdon.
Mr. F. Goodliff, Montagu House, Huntingdon.
Mr. A. Jordan, Wistaria House, St. Neots.
Mr. J. P. Pentelow, Tollington House, Somersham St. Ives, Hunts.

LEICESTER.

Tidal Wave (Super Premium).

Owner :—Mr. R. L. Fenwick, Little Belvoir, Melton Mowbray.

Route :—Melton Mowbray, Waltham, Six Hills, Loughborough, and Brooksby.

Committee :—

Mr. H. Black, Frisby-on-the-Wreake, Leicester.
Mr. J. E. Tidmas, Normanton-on-Soar, Loughborough.
Mr. D. Ward, Bescaby, Melton Mowbray.

Golden Song (Board's Premium).

Owner :—Mr. H. T. Hincks, Wigston Hall, Leicester.

Route :—Wigston, Cosby, Kirkby Mallory, Market Bosworth, Osbaston, Nailstone, Anstey, Woodhouse Eaves, Quorn, Wanlip, Leicester, and Burton Overy.

Committee :—

Mr. S. Nevins Bankart, Hazeldene, London Road, Leicester.
Mr. R. Bingley, Smeeton Westerby, Leicester.
Mr. J. Nelson, Kirkby Mallory, Hinckley.
Mr. G. M. Pettifor, Anstey, Leicester.

NORTHAMPTON.

Chanteur (Super Premium).

Owner :—Mr. J. Drage, Chapel Brampton, Northampton.

Route :—Chapel Brampton, West Haddon, Crick, Daventry, Woodford, Towcester, and Northampton.

Committee :—

Mr. W. D. Grant Ives, Braddon, Towcester.
Mr. J. G. Lawrence, High Street, Daventry.
Mr. E. Messinger, Chapel Brampton, Northampton.
Mr. W. Murland, Badby House, Daventry.

Ulpian (King's Premium).

Owner :—Mr. D. Fraser, Tickford Park, Newport Pagnell, Bucks.

Route :—Wansford, Rockingham, Kettering, Wellingborough, Thrapston, and Oundle.

Committee :—

Mr. W. Cheney, Barnwell, Oundle.
Mr. H. Czarnikow, Barnwell Castle, Oundle.
Mr. F. Percival, Thornhaugh, Wansford.
Mr. J. Singlehurst, Weldon, Kettering.

Snap Dragon (Board's Premium).

Owner :—Mr. J. Drage, Chapel Brampton, Northampton.

Route :—Chapel Brampton, Market Harborough, Cranoe, Kilworth, Brixworth, and Denton.

Committee :—

Mr. J. Brown, Earl's Barton House, Northampton.
Mr. E. Messinger, Chapel Brampton, Northampton.
Mr. H. R. Roe, Cranoe, Market Harborough.

RUTLAND.

Cyclops Too (Board's Premium).

Owner :—Mr. G. E. Gibson, M.R.C.V.S., Oakham.

Route :—Oakham, Braunston, Loddington, Hallaton, Thorpe-by-Water, Glaston, Luffenham, Wymondham, Stapleford, and Whissendine.

Committee :—

Mr. A. R. Barnett, Thistleton, Oakham.
Mr. G. E. Gibson, M.R.C.V.S., Oakham.
Mr. J. Northen, Thorpe-by-Water, Uppingham.

DISTRICT CLASS 10.

Cambridge, Isle of Ely, Norfolk, and Suffolk.
3 King's Premiums and 4 Board's Premiums.

NORFOLK.

Merry Fox (King's Premium).

Owner :—Capt. A. E. Clerk, c/o The Manager, Burton Agnes Stud, Driffield, Yorks.

Route :—King's Lynn, Stow, Narborough, Massingham, Stanhoe, and Hunstanton.

Committee :—

Mr. A. E. Birch, Watlington Hall, Downham Market.
Mr. G. Brereton, Flitcham Hall, King's Lynn.
Mr. J. Dennick, Valinger House, King's Lynn.
Mr. W. Goodwyn, East Winch, King's Lynn.
Mr. D. S. Jack, M.R.C.V.S., King's Lynn.

Sea Bath (King's Premium).

Owners :—The Exors. of the late R. W. Palmer, Swafield House Stud Farm, North Walsham, Norfolk.

Route :—North Walsham, Acle, Loddon, Harleston, Wymondham, and Norwich.

Committee :—

The Rev. A. Fellowes, Shotesham Vicarage, Norwich.
Mr. E. D. Horsefield, Antringham, North Walsham, Norfolk.
Mr. T. O. Springfield, Aldburgh House, Harleston.

* **Gateboy** (Board's Premium).

Owners :—The Association of Farmers in Norfolk, *per* Mr. H. Overman, Kipton House, Weasenham St. Peter, Swaffham.

Route :—Dunston Hall, Swaffham Pickenham, Cley, Westacre, Rougham, Lexham, Litcham, Raynham, Weasenham St. Peter East Rudham, Burnham, Creake, Fakenham, Aylsham, and East Dereham.

Committee :—

Colonel G. F. Buxton, Dunston Hall, Norwich.
Major A. Collison, Weylands, Cromer.
Mr. F. D. Ives, The Grange, Erpingham, Norwich.
Mr. H. Overman, Kipton House, Weasenham St. Peter, Swaffham.

† **Misanthrope** (Board's Premium).

Owner :—Mr. H. Overman, Kipton House, Weasenham St. Peter, Swaffham.

Route :—Weasenham and District.

No Committee.

SUFFOLK.

General Stössel (King's Premium).

Owner :—Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwick.

Route :—Ipswich, Hadleigh, Saxmundham, Woodbridge, Manningtree District, Stowmarket, and Needham Market.

Committee :—

Mr. J. G. Howells, St. Edmunds Road, Ipswich.
Mr. J. R. Keeble, Brantham Hall, Manningtree.
Mr. A. Phillips, 14, Museum Street, Ipswich.

Chance Bird (Board's Premium).

Owner :—Mr. T. Davidson, 18, Percy Gardens, Tynemouth, North Shields, Co. Durham.

Route :—Nowton, Horringer, Haverhill, Thurlow, Long Melford, Lawshall, Bury St. Edmunds, and Fornham.

Committee :—

Mr. S. R. Jaggard, Ixworth, Bury St. Edmunds.
The Rev. Sir W. Hyde Parker, Bart., Melford Hall, Long Melford.
Mr. H. Westrop, Long Melford.

Popoffka (Board's Premium).

Owner :—Mr. P. Palmer, Thornham, Eye, Suffolk.

Route :—Thornham, Eye, Debenham, Stradbroke, Halesworth, Schole, and Diss.

Committee :—

Mr. T. Lang, Thornham Parva, Eye, Suffolk.
Mr. R. Nestling, White House, Earl Soham, Framlingham, Suffolk.
Mr. J. Staff, Bergate Hall, Diss.

* Hunter Stallion. † Percheron Stallion.

DISTRICT CLASS 11.

Bucks, Essex, Herts, and Middlesex.
3 King's Premiums and 1 Board's Premium.

BUCKS.

Blue Stone (King's Premium).

Owner :—Mr. D. Fraser, Tickford Park, Newport Pagnell, Bucks.

Route :—Newport Pagnell, Cosgrove, Hanslope, Stony Stratford, Buckingham, and Fenny Stratford.

Committee :—
Mr. F. W. Coales, Lathbury, Newport Pagnell.
Mr. M. Grimes, Tickford Park Stud, Newport Pagnell.
Mr. C. D. Pennant, Lillingstone Dayrell, Buckingham.

ESSEX.

Captain Jack (King's Premium).

Owner :—Mr. A. S. Bowlby, Gilston Park, Harlow, Essex.

Route :—Harlow, Bishop's Stortford, Dunmow, Braintree, Witham, Chelmsford, and Ongar.

Committee :—
Mr. T. Christy, Roxwell, Chelmsford.
Mr. J. Hughes, Gilston Park, Harlow.
Mr. A. J. Waters, Coopersale Lodge, Epping.
Mr. J. Bishop Young, F.R.C.V.S., Braintree.

Kano (King's Premium).

Owner :—The Hon. Mrs. Ives, Moyns Park, Birdbrook, Halstead.

Route :—Birdbrook District, Halstead, Saffron Walden, Braintree, Sudbury, and Colchester.

Committee :—
Mr. T. W. Goodchild, Great Yeldham, Halstead.
Mr. R. D. Hill, Holfield Grange, Coggeshall.
Mr. W. Price, Rylands, Steeple Bumpstead.
Mr. J. Bishop Young, F.R.C.V.S., Braintree.

HERTS.

Sammarco (Board's Premium).

Owner :—Mr. H. Arnold, Crews Hill Paddocks, Enfield, Middlesex.

Route :—Barnet, Elstree, St. Albans, Harpenden, Hatfield, Hertford, and Hoddesdon.

Committee :—
Mr. J. Bell, Cattlegate, Enfield.
Capt. W. P. Jeffcock, West Common, Harpenden.
Mr. J. C. McCowan, Hatfield.
Mr. S. H. Wall, Homestead Stud Farm, Galley Lane, Barnet.

DISTRICT CLASS 12.

Kent, Surrey, and Sussex (East and West).
4 King's Premiums and 2 Board's Premiums.

KENT.

Stortford (King's Premium).

Owner :—Capt. H. Faudel Phillips, Mapleton Stud, Eden Bridge, Kent.
Route :—Eden Bridge, Tonbridge, Paddock Wood, Maidstone, Kemsing, and Sevenoaks.
Committee :—
Mr. M. R. Aird, 3, Hyde Park Square, London, W. 2.
Mr. G. Arnold, Hall Place, East Peckham, Paddock Wood.
Mr. W. M. Brydone, The Kennels, Otford, Sevenoaks.
Mr. T. P. Hirons, Linton Park, Maidstone.

Chalk Stream (Board's Premium).

Owner :—Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwick.
Route :—Headcorn, Newnham, Hernhill, Bishopsbourne, Lyminge, Ashford, and Great Chart.
Committee :—
Mr. A. J. Burrows, Ashford, Kent.
Mr. T. P. Hirons, Linton Park, Maidstone.
Mr. W. L. Hubble, The Orchard, Hernhill, Faversham.
Mr. H. W. Selby Lowndes, Handley Cross, Lyminge, Folkestone.

SURREY AND SUSSEX (EAST).

Rockaway (King's Premium).

Owner :—Mr. C. Kelway-Bamber, Priestlands Stud, Martyrs, Crawley, Sussex.
Route :—Burgess Hill, Uckfield, East Grinstead, Holmwood, Dorking, Epsom, and Reigate.
Committee :—
Mr. C. H. Howard, M.R.C.V.S., 41, High Street, Dorking.
Mr. Watkin James, Fir Grove, Burgess Hill, Sussex.
Mr. H. F. Sturdy, M.F.H., Felcourt, East Grinstead.

SUSSEX (EAST).

Eton Boy (King's Premium).

Owner :—Mr. H. P. Nickalls, The Kennels, Horley, Surrey.
Route :—Catsfield, Ninfield, Hailsham, Polegate, Firle, Ringmer, Blackboys, Mayfield, Wadhurst, Ticehurst, Hurst Green, and Battle.
Committee :—
Mr. J. E. Muggeridge, New Place, Framfield, Uckfield.
Mr. H. T. Simmons, Wychnour, Battle, Sussex.
Mr. T. Kirby Stapley, M.F.H., The Kennels, Catsfield, Battle.

SUSSEX (WEST).

Cook-a-Hoop (Super Premium).

Owner :—Major Sir Merrik R. Burrell, Bart., Knepp Castle, Horsham.

Route :—Arundel, Lavant, Petworth, Knepp Castle, West Grinstead district, Ashington district, Steyning, and Pulborough.

Committee :—

Mr. E. Brown, Knepp Castle Stud Farm, West Grinstead.
Mr. F. H. Sawtell, Langford, Chichester.
Mr. C. H. Spurgeon, High Street, Petworth.
Mr. J. B. Watson, Estate Office, Petworth.

SURREY AND SUSSEX (WEST).

* **The Best** (Board's Premium).

Owner :—Major Sir Merrik R. Burrell, Bart., Knepp Castle, Horsham.

Route :—Slinfold, Plaistow, Midhurst, Petworth, Knepp, Shipley district, Guildford, Godalming, and Haslemere.

Committee :—

Mr. E. Brown, Knepp Castle Stud Farm, West Grinstead.
Mr. C. H. Spurgeon, High Street, Petworth.
Mr. J. B. Watson, Estate Office, Petworth.

DISTRICT CLASS 13.

Berks, Hants, and Isle of Wight.
3 King's Premiums and 3 Board's Premiums.

BERKS.

Persimmon's Pride (King's Premium).

Owner :—Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwick.

Route :—Twyford, Maidenhead, Windsor, Ascot, Bracknell, Wokingham, Strathfieldsaye, Hartley Row, Odiham, and Yateley.

Committee :—

Mr. C. Aldin, The Kennels, Purley, near Reading.
Mr. R. H. Gosling, The Kennels, Bracknell.
Mr. St. G. Littledale, Wick Hill House, Bracknell.
Mr. G. P. Male, Friar Street, Reading.
Sir G. Mildmay, Bart., Dogmersfield Park, Winchfield, Hants.
Mr. E. M. Sturges, Barkham Square, Wokingham.

Political (King's Premium).

Owners :—The Compton Stud, Sandley, Gillingham, Dorset.

Route :—Buscot, Shrivenham, Kingston Lisle, Garford, and Shippon (Abingdon).

Committee :—

Mr. L. A. Barrett, Milton, Steventon, Berks.
Mr. W. Crosland, Estate Office, Buscot Park, Faringdon, Berks.
Mr. E. Robson, Stockham, Wantage, Berks.

* Hunter Stallion.

HANTS.

Egret (King's Premium).

Owner :—Mr. J. E. A. Willis-Fleming, Stoneham Park, Eastleigh, Hants.

Route :—Petersfield, Havant, Fareham, Wickham, West Meon, Hawkley, and Liss.

Committee :—
Mr. R. Austin, Bishop's Waltham, Hants.
Admiral Baily, Hinton House, Horndean.
Mr. S. Hardy, The Spain, Petersfield.
Capt. P. W. Seward, Weston, Petersfield

Be the Husth (Board's Premium).

Owner :—Mr. J. E. A. Willis-Fleming, Stoneham Park, Eastleigh, Hants.

Route :—Romsey, Whiteparish, Salisbury, Grateley, Andover, and Stockbridge.

Committee :—
Capt. G. Eyre Matcham, Newhouse, Redlynch, Salisbury.
Mr. H. Martin Powell, Wilverley Park, Lyndhurst.
Mr. E. E. Ralls, 19, Market Place, Romsey.
Mr. G. Thursby, Fountain Court, Brook, Lyndhurst.
Mr. J. E. A. Willis-Fleming, Stoneham Park, Eastleigh, Hants.

Thorndyke (Board's Premium).

Owner :—Mr. H. Arnold, Crews Hill Paddocks, Enfield, Middlesex.

Route :—Bishop's Waltham, Tichborne, Alton, Basingstoke, Whitchurch, and Hursley Park.

Committee :—
Mr. R. Austin, Bishop's Waltham, Hants.
Mr. J. F. Complin, Holybourne, Alton.
Mr. F. Coryton, The Manor House, Greatham, Liss, Hants.
Mr. T. A. Edney-Hayter, The Mount, Whitchurch, Hants.
Sir Richard Rycroft, Bart., Dummer House, Basingstoke.

ISLE OF WIGHT.

Square Root (Board's Premium).

Owner :—Dr. W. J. Jolliffe, Yafford House, Shorwell, Newport, Isle of Wight.

Route :—Shorwell, Sandown, Ryde, Yafford, and Freshwater.

Committee :—
Mr. J. Attrill, Waytescourt, Brighstone, Newport, Isle of Wight.
Capt. H. Collingwood Bertram, West Standen, Newport, Isle of Wight.
Major-Gen. Fetherstonhaugh, Gwydyr House, Ryde, Isle of Wight.

DISTRICT CLASS 14.

Dorset, Somerset, and Wilts.
6 King's Premiums and 2 Board's Premiums.

DORSET.

Red King (King's Premium).

Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Bagber, Ansty, Bere Regis, Sturminster Marshall, and Blandford.
Committee :—
Mr. T. Bartlett, Screech Hill, St. Giles, Cranborne, Salisbury.
Mr. R. Cave, Alner, Blandford.
Mr. W. C. Martin, Moor Court, Wimborne.

Thistledown (Board's Premium).

Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Dorchester, Maiden Newton, Beaminster, Leigh, Cerne Abbas, and Puddletown.
Committee :—
Colonel H. Alexander, D.S.O., The Grange, Chetnole, Dorset.
Colonel Brough, 56, High West Street, Dorchester.
Mr. F. Pope, Great Toller, Dorchester.

SOMERSET.

Gay Lally (Super Premium).

Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Shepton Mallet, Wells, Bruton, and Frome.
Committee :—
Mr. G. Adlam, Wookey Hole, Wells.
Mr. L. B. Beauchamp, Norton Hall, near Bath.
Mr. A. C. Clarke, Red Lion Hotel, Shepton Mallett.
Mr. H. T. B. Saunders, Woodside, Sparkford, Bath.

King Edgar (King's Premium).

Owner :—Mr. B. M. Slocock, Hanover House, Carlow, Ireland.
Route :—Keynsham, Long Ashton, Portishead, Clevedon, Yatton, Congresbury, Worle, Banwell, Blagdon, and Harptree.
Committee :—
Mr. R. A. Bowring, Rockhill, Keynsham, Bristol.
Mr. E. A. Hardwick, Seaton, Tavistock, Devon.
Mr. T. H. Pearce, Long Ashton, Bristol.

King of the Wavelets (King's Premium).

Owner :—Mr. S. Mumford, Stud Farm, Moreton Morrell, Warwick.
Route :—Dulverton, Wiveliscombe, Williton, and Minehead.
Committee :—
Mr. H. H. Sweet Escott, Bicknoller, Taunton.
Mr. C. L. Hancock, Cothelstone Manor, Taunton.
Mr. D. J. Tapp, Higher Combe, Dulverton.

Lorello (Board's Premium).
Owner :—Mr. A. G. Parsons, Kilmington Stud, Axminster, Devon.
Route :—Yeovil, Kingsdon, Curry Rivel, Taunton, Chard, Crewkerne, and Wellington.
Committee :—
Capt. G. Phipps Hornby, Somerton Erleigh, Somerset.
Mr. J. F. Neal, Kingsdon, Taunton.
Mr. J. White, Gate House, Taunton.

WILTS.

Garborian (King's Premium).
Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Chippenham, Melksham, Westbury, Devizes, and Calne.
Committee :—
Mr. F. Doble, Berwick Bassett, Swindon, Wilts.
Mr. C. Garnett, Great House, Kington Langley, Chippenham, Wilts.
Mr. W. Preston, M.F.H., Seend, Melksham, Wilts.

Wilful Willie (King's Premium).
Owners :—The Compton Stud, Sandley, Gillingham, Dorset.
Route :—Swindon, Wootton Bassett, Malmesbury, Cricklade, and Highworth.
Committee :—
Mr. H. Baker, Chedglow Manor, Crudwell, Malmesbury.
Mr. G. Buxton, Tottenham Manor, Wootton Bassett.
Mr. H. C. Sutton, Holdcroft, Blunsdon, Highworth, Swindon.

DISTRICT CLASS 15.

Cornwall and Devon.
3 King's Premiums and 3 Board's Premiums.

CORNWALL.

Marzio (King's Premium).
Owner :—Mr. M. J. Taylor, Ermington, Ivybridge, Devon.
Route :—Liskeard, Callington, Launceston, Camelford, Wadebridge, Bodmin, Lostwithiel, Duloe, and Looe.
Committee :—
Mr. C. Burleigh, Sportsman's Arms, Menheniot Station, Liskeard.
Mr. H. G. P. Hoblyn, Colquite, Washaway, Cornwall.
Mr. Brooking Trant, Trethawle, Liskeard.
Mr. T. Yeo, St. Leonards, Bodmin.

Adular (Board's Premium).
Owners :—Board of Agriculture and Fisheries, Whitehall Place, London, S.W. 1.
Route :—Truro, St. Columb, St. Austell, Penzance, Helston, and Redruth.
Committee :—Mr. Coulter Hancock, 12, Princes Street, Truro.
Mr. H. Montagu Rogers, Nansloe, Helston.
Major J. Williams, Scorrier House, Scorrier, Cornwall.

DEVON.

Golden Grebe (King's Premium).

Owners :—Messrs. W. & H. Whitley, Primley Farm, Paignton.
Route :—Paignton, Totnes, South Brent, Plympton, Yealmpton, Kingsbridge, Newton Abbot, Exeter, and Dawlish.
Committee :—
Mr. M. Ball, Newton Abbot.
Mr. P. G. Bond, M.R.C.V.S., 105, Union Street, Plymouth.
Mr. C. Harris Pitts, South Allington, Kingsbridge.

Wuffy (King's Premium).

Owner :—Mr. A. G. Parsons, Kilmington Stud, Axminster, Devon.
Route :—Axminster, Honiton, Seaton, and Sidmouth Junction.
Committee :—
Mr. R. J. Broom, Boro' House, Axmouth, Axminster.
Mr. C. Foward, Solicitor, Axminster.
Mr. H. W. Gould, 2, Bedford Circus, Exeter.
Mr. G. D. Lansley, M.R.C.V.S., Axminster.

Bridge of Orchy (Board's Premium).

Owners :—The Bingham Lodge Stud, Chard.
Route :—Okehampton, Tavistock, Holsworthy, Tiverton, Crediton, and Cullompton.
Committee :—
Mr. J. Farrant, Tiverton.
Major L. C. Garratt, Mill Down, Clyst St. Mary, Exeter.
Mr. A. C. Godfrey, Tavy Cottage, Tavistock.
Mr. E. F. Northey, Higher Bowden, Okehampton.

Monkey Brand (Board's Premium).

Owner :—Mr. A. G. Parsons, Kilmington Stud, Axminster, Devon.
Route :—Barnstaple, South Molton, Torrington, and Bideford.
Committee :—
Mr. W. Harris, Bountisthorn, West Putford, Devon.
Mr. T. W. Smith, East Down, Barnstaple.
Mr. H. Turner, The Barton, Instow, North Devon.

All the Stallions are thoroughbred except where otherwise indicated.

THE following Note has been communicated to the Board by A. W. Oldershaw, B.Sc., Agricultural Organiser for East Suffolk, and Honorary Secretary of East Suffolk War Agricultural Committee :—

East Suffolk Scheme for the Distribution of Sulphate of Ammonia.

Immediately it was constituted (at the end of January, 1917), the Executive Committee of East Suffolk War Agricultural Committee gave careful consideration to the question of supplies of artificial manures. In view of the lateness of the time at which executive powers were granted to the Committee, the members came to the conclusion that they were more likely to increase agricultural production in 1917 by stimulating the use of artificial manures than by any other activity which might engage their attention.

There was therefore called a preliminary conference, which the manure manufacturers and merchants in the county were invited to attend, and the whole question of chemical manures was discussed.

It was ascertained that practically all the phosphatic manures available for this season were already sold. The Committee therefore decided that it was useless to take any action with reference to these manures. Inquiry elicited the fact that considerable supplies of sulphate of ammonia were available. Most of this, however, was in store in manufacturing centres in the north and midlands of England at a considerable distance from East Suffolk, and the local merchants were not prepared to buy and store any considerable quantity of this on the chance of its being purchased by East Suffolk farmers.

After careful consideration the Committee decided that the best course to pursue would be for them to purchase a preliminary 200 tons from local firms and re-sell it to farmers. This course was adopted with the approval of the Board of Agriculture. All members of the District War Agricultural Committees were asked to canvass the parishes which they represented, and to obtain orders for sulphate of ammonia. It may be mentioned that on an average each member of a District War Agricultural Committee in the county represents two parishes, so that the work placed on any individual member did not prove very onerous.

At the commencement of February, when the canvass was undertaken, most of those farmers who are in the habit of using chemical manures had already made their purchases, the Committee having appealed to farmers, by means of

posters and a circular letter sent out to every farmer in the county in November, 1916, to use an increased quantity of chemical fertilisers and to purchase early.

As a result, however, of the personal canvass made by the members of the District Committees, orders were obtained for no less than 694 tons 16 cwt. of sulphate of ammonia.

The success of the scheme must be attributed in great part to the enthusiasm with which the members of the District Committees canvassed their neighbours.

It may be mentioned that with each invoice, a short leaflet written by the County Agricultural Organiser was enclosed. This leaflet gave detailed instructions in as clear a manner as possible as to the use of the manure and the crops to which it should be applied.

It may be estimated that with ordinary good fortune, and if used judiciously, 1 cwt. of sulphate of ammonia is likely to produce 2½ cwt. of grain. On this basis the increased quantity of grain obtained in the county as a result of the action taken by the Committee may be placed roughly at 1,700 tons.

OFFICIAL NOTICES AND CIRCULARS.

LIVE STOCK—CEREAL FOODS—PRICES—CULTIVATION—LABOUR—MISCELLANEOUS.

LIVE STOCK.

THE following Leaflet, dated March, 1917, has been issued by the Food Production Department of the Board :—

Loan of Horses to Farmers for Agricultural Work.

1. The Board of Agriculture desire to inform farmers that the War Office has made arrangements by which draught horses and mules with drivers may be placed temporarily at the disposal of farmers, in the vicinity of camps who require such assistance for farm work. The arrangement is subject to the Officer Commanding being satisfied that such horses and mules can be spared without prejudice to military requirements.

2. Horses and mules will be let out with their military drivers, or in cases where a skilled ploughman is available on the farm the Officer Commanding may at his discretion send out the horses without drivers. Where possible they will have to return to quarters each night, but in some cases the Officer Commanding may allow them to be stabled on the farm during the night.

3. The rates of payment will be as follows :—4*s.* for each horse or mule for a working day of not more than 8 hours, or 2*s.* 9*d.* a day in cases where the horses do not return to quarters at night (the farmer

to supply forage at his own expense, and, where necessary, proper stabling); 4*s.* a day for each soldier-driver, or, if the soldier is found board and lodging by the farmer, 2*s.* 6*d.* per day. Payment must be made at the end of each week to the cashier of the Command.

4. Applications for horses and drivers should be made by the farmer to the Commanding Officer of the nearest unit that is in possession of draught horses or mules. It should be noted particularly that the facilities are offered only to farmers in the neighbourhood of military stations or camps.

Slaughter of Calves.

THE Board of Agriculture and Fisheries have made an Order to operate on the 19th April which withdraws the restrictions on the slaughter of calves imposed by the Maintenance of Live Stock Orders of 1915 and 1916.

CEREAL FOODS.

The Barley (Requisition) Order, 1917.

THE Food Controller has issued an Order, dated 16th April, 1917, to the effect that:—1. All persons owning or having power to sell or dispose of any barley (other than home-grown barley which has not been kiln dried) shall place such barley at the disposal of the Food Controller, and shall deliver the same to him, or such persons as may be named by him, in such quantities and at such time as the Food Controller may from time to time require.

2. Pending any direction no person shall remove or otherwise dispose of any such barley (whether in pursuance of a contract existing at the date of this Order or not), and all persons concerned shall take such steps as may be reasonably necessary to maintain the same in good condition.

3. All persons owning or having to sell or dispose of such barley shall, on or before the 30th April, 1917, furnish to the Food Controller, Grosvenor House, Upper Grosvenor Street, London, W. 1, a statement on forms to be obtained from the Food Controller, giving particulars of all such barley in their possession or under their control at the date of this Order, and of all their existing contracts if any for the sale of such barley.

4. The Food Controller will subsequently communicate to the owners of barley taken over by him the prices which he will be prepared to pay for the same.

5. The arbitrator to determine in default of agreement the compensation to be paid for barley requisitioned under this Order shall be appointed by the Lord Chief Justice of England.

6. The Order shall not apply

(*a*) To persons who do not own more than 25 qr. (448 lb. per quarter) of barley at the date of the Order;

(*b*) To barley in the hands of or held to the order of flour millers at the date of this Order;

(*c*) To barley agreed to be sold to the Royal Commission on the Wheat Supply.

The Wheat, Rye, and Rice (Restriction) Order, 1917.

THE Food Controller has issued an Order, dated 20th April, 1917, to the effect that except under the authority of the Food Controller, the following regulations shall be observed by all persons concerned :—

1. (*a*) No person shall use any wheat or rye except for the purpose of seed or except in the process of manufacturing flour.

(*b*) This clause shall not apply to tailings or screenings or to wheat or rye which has been so damaged as to be unsaleable for milling.

2. (*a*) No person shall, after the 28th April, 1917, use any wheaten flour, rye flour, rice or rice flour, except in the manufacture of articles suitable for human food, or use any article containing any wheaten flour, rye flour, rice or rice flour except as human food.

(*b*) This clause shall not apply to wheaten flour, rye flour, rice or rice flour which on the 28th April, 1917, had been so treated as to be unfit for the purposes of human food, or to any article which on the 28th April, 1917, is unfit for such purposes.

3. No person shall damage or permit to be damaged or, after the 28th April, 1917, treat or permit to be treated any wheat, wheaten flour, rye, rye flour, rice or rice flour, or any article containing wheaten flour, rye flour, rice or rice flour, so as to render the same less fit for the purposes for which under this Order it is reserved.

4. No person shall waste or permit to be wasted any flour or other article referred to in the last preceding clause.

5. Any person authorised by the Food Controller may take samples of any wheat, wheaten flour, rye, rye flour, rice or rice flour or other article which he has reason to suspect is being used, treated or damaged or is intended to be used, treated or damaged in contravention of this Order.

6. For the purposes of this Order the expression "Wheaten Flour" shall include any flour of which flour obtained from wheat forms part.

7. The Waste of Wheat Order, 1916, and the Wheat (Restriction) Order, 1917, are hereby revoked without prejudice to any proceedings in respect of any contravention thereof.

The Flour Mills Order, 1917.

THE Food Controller has issued an Order, dated 20th April, 1917, to the effect that :—1. The provisions of Regulation 2GG of the Defence of the Realm Regulations are hereby applied as from the 30th April, 1917, to all flour mills in the United Kingdom which at the date of this Order use any wheat in the making of flour except mills the output capacity of which is less than 5 sacks of flour per hour.

Regulation 2GG of the Defence of the Realm Regulations.

2GG.—(1) Where the Food Controller is of opinion that it is necessary or expedient to do so for the purpose of his powers and duties, he may by Order apply the provisions of this Regulation to factories and workshops and other premises in which any article of food specified in the Order is manufactured or produced or adapted for sale ; and any such Order may apply either generally to all such factories, workshops and premises, or to any class or description of such factories, workshops and premises, or to any special factories, workshops and premises.

(2) Any factory, workshop or premises to which this Regulation is so applied shall by virtue of the Order pass into the possession of the Food Controller as from the date of the Order or from any later date mentioned in the Order, and the occupier of every such factory, workshop

or premises, and every officer of such occupier, and where the occupier is a company, every director of the company, shall comply with the directions of the Food Controller as to the management and user of the factory, workshop or premises, and if he fails to do so, he shall be guilty of a summary offence against these Regulations.

(3) It is hereby declared that the possession by the Food Controller under this Regulation of any factory, workshop or premises shall not affect any liability of the actual occupier thereof, under the Factory and Workshop Act, 1901, or any Act amending the same.

(4) Any Order of the Food Controller under this Regulation may be revoked or varied as occasion requires.

PRICES.

THE Food Controller has issued an Order, dated 16th April, 1917, to the effect that :—1. Except under the authority of the Food Controller no wheat, barley (other than kiln barley) or oats harvested in the United Kingdom in the year 1916 may be sold at prices exceeding prices at the following rates : Wheat—78*s.* per quarter of 480 lb. ; Barley—65*s.* per quarter of 400 lb. ; Oats—55*s.* per quarter of 312 lb.

The Wheat, Barley, and Oats (Prices) Order, 1917.

2. The buyer shall be entitled to require the grain to be placed on rail or (at the option of the seller) to be delivered to the buyer's premises, and no additional charge may be made in respect thereof.

3. Except in so far as the Food Controller may in any particular case otherwise determine, the following provision shall have effect in the case of any contract subsisting at the date of this Order for the sale of any of the grains mentioned where the contract price exceeds the permitted maximum price :—

The contract shall stand so far as concerns any such grain which has been paid for or has been delivered, or which under the contract is to be delivered within one month from the date of such contract, but otherwise shall be avoided.

4. No person shall sell or buy or offer to sell or buy any of the grain mentioned at a price exceeding the permitted maximum price or in connection with a sale or proposed sale of any such grain enter or offer to enter into any fictitious or artificial transaction or make any unreasonable charge.

THE Food Controller issued an Order, dated 3rd April, 1917, to the effect that :—1. On and from the 1st April, 1917, all the prices referred to in the First Schedule to the Seed Potatoes (Prices) Order, 1917,* (hereinafter called the principal Order), shall be increased by the sum of £2, and such Order shall throughout take effect accordingly.

The Seed Potatoes (Prices) Order (No. 2), 1917.

2. The date the 1st May, 1917, shall be submitted for the date the 1st April, 1917, in clause (*c*) of Article 14 of the principal Order, and in Article 11 of the Potatoes 1916 Main Crop (Prices) Order (No. 2), 1917, and for the date the 31st March, 1917, in clause (*d*) of Article 6 of the Seed Potatoes Order, 1916, as amended by the principal Order.

3. As from the 1st April, 1917, the expression "Seed Potatoes" shall, for the purposes of all the Orders referred to in Article 2, mean any potatoes which will not pass through a riddle having a one-inch mesh and will pass through a riddle having a two-inch mesh.

* See *Journal*, March, 1917, p. 1280.

4. The Seed Potatoes (Growers' Prices) Order, 1917, shall, as regards Ireland, cease to be in force on the 1st May, 1917, and Articles 3, 4, 5 and 6 of the Potatoes (Ireland) Order, 1916, shall remain in force till that date.

5. This Order may be cited as the Seed Potatoes (Prices) Order (No. 2), 1917.

The Seed Potatoes (Prices) Order (No. 3), 1917.

BY the Seed Potatoes (Prices) Order (No. 3), 1917, dated 30th April, the Food Controller has extended until 1st June, 1917, the Orders regulating the prices at which seed potatoes may be sold.

Guaranteed Minimum Price for Potatoes.

A NUMBER of inquiries have been addressed to the Board of Agriculture and Fisheries as to the guaranteed minimum price for potatoes that was promised in the Prime Minister's speech in the House of Commons on 23rd February last. The President of the Board wishes it to be known that the promise is to be interpreted on the lines indicated by the previous offer made by the Food Controller, *i.e.* that the Government guarantees to the grower a price of £6 per ton f.o.r. or f.o.b. for all sound marketable ware potatoes grown in 1917, which will not pass through a 1⅝-in. sieve, in lots of not less than 4 tons on and after 15th September. Detailed Regulations will be issued.

Farmers and Retail Sales of Potatoes.

THE Food Controller has announced that on the interpretation placed by his Department on the Potatoes 1916 Main Crop (Prices) Order (No. 2), 1917, a person who, in the ordinary way of business, sells potatoes by way of retail sales, is allowed, although he is the grower, to charge the maximum price of 1¾*d.* per lb.

CULTIVATION.

Temporary Entry on Land for Specific Acts of Cultivation.

THE following Memorandum, dated 16th April, 1917, has been issued by the Food Production Department of the Board to War Agricultural Executive Committees :—

It has been brought to the notice of the Department that some Executive Committees do not fully realise that the Cultivation of Lands Order, 1917 (No. 3), authorises them to enter *temporarily* on any land for the purpose of doing specific acts of cultivation or adaptation for cultivation, and to recover from the occupier such amount as represents the value to him of the work done.

In the Board's circular letter of the 23rd January last, (A290/C), reference was made to this power in paragraphs 14 and 15, and the Director-General thinks it desirable to call the attention of Committees to the matter again.

If Committees are of opinion, for instance, that certain fields should be ploughed by motor-tractors or other means, and the occupiers fail to enter into contracts with the Committee for the work to be done, the Committee may enter temporarily and do the work themselves. If the occupier refuses to pay the cost the Committee should take proceedings for recovery of the amount due in accordance with paragraph 4 of Regulation 2M.

Similarly, the power of temporary entry may be used for the purpose of applying fertilisers to any land or doing any other acts of cultivation or adaptation for cultivation.

Action on these lines may be taken by Committees without the necessity of obtaining the previous sanction of the Board in each case. In order to avoid any unnecessary delay it might be well for Committees, in connection with their ploughing programme, to pass a general resolution authorising entry under Regulation 2M on all the lands included in the programme, so that in case any of the farmers fail to sign contracts, entry may be made and the ploughing done forthwith without having to wait for the next meeting of the Committee. At the same time every endeavour should be made to conclude contracts with the farmers, so as to avoid the exercise of the powers of the Regulation except where absolutely necessary.

THE following Notice, dated April 26th, 1917, has been issued by the Food Production Department of the Board :—

Cultivation of Lands Order, 1917 (No. 2).*

Representations having been made to the Board of Agriculture and Fisheries to the effect that the period of the present year guaranteed to cultivators of small allotments provided under the Cultivation of Lands Order, 1917 (No. 2), is not sufficient to enable them to obtain a full return for their labour, Regulation 2L of the Defence of the Realm Regulations has been amended so as to extend the guarantee for a further period of twelve months.

"The first day of January, 1919," has been substituted for the "first day of January, 1918," in sub-section (3) of Regulation 2L, which now provides that a cultivator of land under the Regulation whose occupation is determined by or on behalf of the Board before the 1st January, 1919, shall receive from the Board such compensation as may have been agreed or, in default of any such agreement, as the Board may consider just and reasonable. A corresponding alteration has been made in Article 7 of the Cultivation of Lands Order, 1917 (No. 2).

With a view to economy of paper and labour the Board do not propose to communicate this amendment to each Local Authority concerned, and they ask that Municipal Boroughs, Urban District Councils, and other bodies to whom the Board's powers under Regulation 2L have been delegated, will note this intimation and will not consider it necessary to communicate with the Board in the matter.

THE Ministry of Munitions, which owns a very extensive tract of fertile agricultural land, in connection with a munitions factory in the North of England, is encouraging its tenants to cultivate hundreds of additional acres by assisting in the ploughing of the land with tractors.

Motor Ploughing under the Ministry of Munitions.

Four American Mogul tractors of 16 horse-power each, with Canadian "Cockshut" three-furrow ploughs attached, have been at work in this vicinity for two months, and, under the organisation and superintendence of Captain Shand, the resident land agent, who represents Sir Howard Frank, the Director-General of the Ministry of Munitions Lands, splendid work has been done.

The introduction of the tractors has aroused much interest amongst the agricultural community, and although at first farmers were somewhat sceptical, they have become quite enamoured of the new invention. So complete indeed has been their conversion that they

* See *Journal* March, 1917, p. 1275.

are in frequent communication with the agent in charge of the work with a view to buying the tractors after he is done with them.

On the Ministry lands the tractors are manned by Army Service Corps M. T. Drivers. Each tractor has a speed of about three miles per hour and the engines, which start on petrol, are worked by paraffin, the consumption of oil being about 2½ gal. per acre. Highly satisfactory work has been done on both lea and stubble land. The ploughs turn the land over to a depth of about 7 in., and the furrows are even, clean, and straight. The average amount ploughed in a full day under very adverse conditions has been 5 acres per tractor, but it has been ascertained that under ideal conditions each tractor can easily plough three-quarters of an acre in an hour. Although a certain amount of ploughing has been done after dusk, with the aid of acetylene lamps, much better results are attained by working in daylight, and, with the introduction of summer time, two shifts are now resorted to—the one from 4.30 a.m. till noon, and the other from noon till 8 p.m.

Besides being useful for ploughing the tractors will be of great assistance during harvest in hauling the binders, in threshing, and in taking the grain to the market.

LABOUR.

Employment of National Service Volunteers in Agriculture.

THE following Circular Letter, dated 27th March, 1917, has been addressed by the Food Production Department of the Board to the War Agricultural Executive Committees in England and Wales :—

SIR,—1. The Board of Agriculture have been in consultation with the National Service Department as to the arrangements by which farmers will be able to secure National Service Volunteers for Agricultural work, and the extent to which the help of War Agricultural Committees should be sought in connection with the Department's scheme.

2. Farmers who are desirous of employing National Service Volunteers (male) must apply on the proper form (NSVA 12), to be obtained from the War Agricultural Executive Committee of the county. The forms when filled in are to be returned to that Committee in order that they may have an opportunity of considering and recommending the relative importance of the applications. This will ensure that priority is given to the applications from farmers known to be most in need of additional labour. Subsequently the forms are to be forwarded by the Committee to the District Agricultural Commissioner of the National Service Department, and it will be the duty of that official to endeavour to supply each farmer concerned with the labour he requires.

3. The Circular Letter issued by the Board on the 2nd inst. relating to the provision of soldier labour, recommended that a Labour Sub-Committee should be appointed in each county, and this same body might be asked to deal with the applications of farmers for National Service Volunteers, as well as any future schemes for dealing with the supply of farm labour.

4. The information obtained by your War Agricultural Committee as the result of the recent County Survey, and any subsequent inquiries which have been made, will doubtless enable the Labour Sub-Committee to consider, without much trouble, the relative importance of the demands of farmers in your county for additional labour.

5. Should your Committee not possess the information necessary to enable them to determine which of the applications are most urgent the forms should be transmitted, with a note to that effect, to the National Service Department's Agricultural Commissioner.

6. The Board of Agriculture trust that your Committee will be prepared to undertake the work outlined above.

I am, etc.,

ARTHUR LEE,

Director-General of Food Production.

Soldier Labour.

THE following Memorandum, dated 31st March, 1917, has been addressed by the Food Production Department of the Board to War Agricultural Executive Committees in England and Wales :—

With reference to the Board's Circular Letter of the 2nd inst., relating to the provision of Soldier Labour, War Agricultural Executive Committees are informed that an Army Council Instruction (No. 525 of 1917) has been issued, pointing out to Commanding Officers that there is reason to think that in many cases where men of Agricultural Companies have been boarded and lodged by their employers, instead of the employer paying the "living-in" rate, he has been allowed to pay the "living-out" rate and have the soldiers billeted on him under Army conditions, the effect of which has been that the employer has paid less than the "living-in" rate.

Commanding Officers have, therefore, been instructed to take care that when men are provided with food and accommodation by their employers, billeting money is not to be paid, but the full amount of the "living-in" rate must be recovered from the employers.

When the employer provides lodging, cooking facilities (including fuel), and light *but not food*, he will be required to pay the "living-out" rate of wages for the men, but against this charge he will be credited with a sum equivalent to that which he would have received if the men had been formally billeted upon him under the Army Act, *i.e.*, 9*d.* per day for the first soldier, and 6*d.* for each additional soldier. A billeting notice will not be served on the farmer who employs the men.

In order to make the effect of this Regulation quite clear the following examples are given :—

1. Assuming the "living-out" rate in the district is 25*s.* and the "living-in" rate 10*s.* per week; the farmer who boards and lodges a soldier may have been permitted hitherto to deduct the billeting allowance of 19*s.* 3*d.* per week from the 25*s.* "living-out" rate, or in other words he has secured the services of the soldier for 5*s.* 9*d.* per week, plus the cost of keeping him, whereas the "living-in" rate for the district is known to be 10*s.* per week. In future the farmer will have to pay the local "living-in" rate, *viz.* 10*s.* per week.

2. Assuming the district rate of wage is 25*s.*, and a farmer has hired two soldiers whom he supplies with lodging, cooking facilities (including fuel) and light but *no food*—

	s.	*d.*	
For the first man he may deduct 9*d.* per day ..	5	3	per week.
For the second man he may deduct 6*d.* per day	3	6	,,
	8	9	

so that the weekly sum due from him is 50*s.*, less 8*s.* 9*d.*—*i.e.*, 41*s.* 3*d.*

Employment of Civilian Prisoners of War in Agriculture.

FARMERS are reminded that the services of individual Civilian Prisoners of War are obtainable for agricultural work, and that it is most desirable that this form of labour should be taken advantage of to the greatest possible extent. Over 500 of these civilian prisoners are already being employed on farm work in various parts of the country, and reports received show that they are giving every satisfaction to their employers.

The Instruction hitherto in force providing that these men shall not be employed in prohibited areas has been modified to the extent that, although they cannot be released to work in prohibited areas in counties on the East Coast, their employment in prohibited areas elsewhere will now be considered, provided certain special conditions are observed. The employer must provide board and lodging, and pay the man at the current rate for English labourers in the district, less 12*s.* 3*d.* per week to meet the cost of board and lodging.

Farmers desirous of employing civilian prisoners should apply to the Secretary of the County War Agricultural Executive Committee for a form of application. The form, when completed and signed, should be sent to the Secretary, Prisoners of War Branch, Home Office, London, S.W.

Military Service (Review of Exceptions) Act, 1917.

THE following Memorandum, dated 28th April, 1917, has been sent by the Food Production Department of the Board to the Agricultural Executive Committees and to the Board's Representatives before the Appeal and Local Tribunals in England and Wales :—

1. It is desired to bring to the notice of all concerned the provisions of the Military Service (Review of Exceptions) Act, 1917, which received the Royal Assent on the 5th April, 1917.

2. The Act gives the Army Council power to call up for examination the following three classes of men excepted from the operation of the Military Service Acts, 1916, as being—

(*a*) a member of the territorial force who is, in the opinion of the Army Council, not suited for foreign service ; and

(*b*) a man (in this Act referred to as a disabled man) who has left or been discharged from the naval or military service of the Crown in consequence of disablement or ill-health (including an officer who has ceased to hold a commission in consequence of disablement or ill-health) ; and

(*c*) a man who has been previously rejected on any ground, either after offering himself for enlistment or after becoming subject to the Military Service Acts, 1916.

3. Any man to whom such a notice is sent and to whom it is applicable will, as from date of the Notice, come within the operation of the Military Service Acts, 1916. The Notice in question is described on the face of it as a Statutory Order (Army Form W.3579).

4. There are two exceptions from the above general powers, which will not extend to the following :—

(*a*) any man who is for the time being engaged in agriculture, and whose work is certified by the Board of Agriculture and Fisheries (or, as respects Scotland, the Board of Agriculture

for Scotland) to be work of national importance, and who was engaged on such work on the thirty-first day of March, nineteen hundred and seventeen ;

(*b*) or any officer or man who has left or been discharged from the naval or military service of the Crown in consequence of disablement if the disablement has been certified under the authority of the Admiralty or the Army Council to be the result of wounds (including injury from poisonous gas) received in battle or in any engagement with the enemy or otherwise from the enemy, or in consequence of neurasthenia or allied functional nerve disease if so certified by a special medical board to be the result of naval or military service in the present war ; but any such man shall, notwithstanding anything in any Act or Regulation, be entitled to offer himself for re-enlistment if he is willing to do so, and to be re-enlisted.

5. In this Memorandum it is only proposed to deal with the procedure to be adopted with regard to the men in England and Wales who are excepted from the Act, for the reason that they come within paragraph 4 (*a*) above.

6. Although the local military authorities have lists in their possession as regards each area showing the men who are brought within the general provisions of the Act (see paragraph 2), they have no precise information as to which men are at present working on the land. It is, therefore, necessary to send a Statutory Order (see paragraph 3) to every man who comes within the general provisions of the Act.

7. If a man engaged in agriculture receives the Statutory Order he should complete the certificate on the back of the Order, if he claims that he is not liable to have the notice sent to him, and return the form to the Recruiting Officer.

8. The military authorities will then send to each County War Executive Committee full particulars of the men in the county who claim to be excepted from the Act on the ground that they were employed in agriculture on the 31st March, 1917, and that their work is of national importance. The Committee will by means of inquiries through the Board's Representatives before the Appeal and Local Tribunals, the Chairmen of the District Committees, or otherwise, ascertain whether each individual man was on the 31st March, 1917, and still is engaged whole time in agricultural work of national importance. Men engaged part time in cultivating a garden will not, of course, qualify for exception, and other analogous cases of part-time workers on the land will occur to the minds of the Committee.

9. If the Committee are satisfied that a man should be excepted they will issue a certificate that he is excepted from the provisions of the Act.

Copies of the form of certificate (F.P. 41) to be used will be supplied to Executive Committees on application to the Food Production Department, 72, Victoria Street, London, S.W. 1.

10. The Committee should complete their inquiries with all possible speed, and should issue the certificate, or notify the Recruiting Officer that they are not prepared to grant a certificate, within three weeks at the latest from the date of the receipt of the particulars from the Military Authorities.

11. The original certificate should be forwarded to the Recruiting Officer concerned, and a signed copy sent to the man himself.

12. If the Recruiting Officer objects in any individual case to the decision of the Executive Committee he will send particulars to the War Office, who will refer the matter to the Food Production Department.

13. If at a later date the Recruiting Officer has reason to believe that a man is no longer *for the time being* excepted from the provisions of the Act he will be justified in issuing a fresh Statutory Order to the man in question.

14. It is desired to impress on the Committee and the Agricultural Representatives the importance of this work being carried out in as expeditious and harmonious a manner as possible with the Recruiting Officers in order to avoid the trouble and delay of correspondence with the War Office and this Department.

15. It is not considered necessary to lay down any hard and fast rules for the guidance of the Committee as regards the particular agricultural occupations which are of national importance, but this Department rely on the Committee and the Agricultural Representatives to carry out their duties in respect of these certificates in the spirit as well as the letter of the provisions of this Memorandum.

Women's Work on the Land.

THE National Service Department and the Board of Agriculture have issued the following directions in regard to women's work on the land under National Service :—

1. *Selection.*—A recruit will sign one of the forms to be obtained at any post office.

2. She will receive a summons from the nearest employment exchange in her district to appear before a joint committee of the employment exchange and the District Selection and Allocation Committee of the Women's War Agricultural Committee at a particular hour on a certain day. Her railway ticket to the place mentioned will be sent to her.

3. She will be interviewed by the District Selection and Allocation Committee, who will consider whether she is physically fit for work on the land. If accepted for service the Committee will then decide :—

(*a*) That she is sufficiently skilled to go straight to a farm as a paid worker.

(*b*) That she is suitable for a bursary, *i.e.*, 15*s.* a week, and allocated direct to the approved farm on which she will work.

(*c*) That she requires four weeks' training at a centre.

4. *Medical Examination.*—The recruit is given a medical certificate which she must get filled in, either if she so wishes by her own doctor at her own expense or by one of the doctors on the Committee's panel nearest her home. She is also given a measurement form for her equipment to fill in at once. She is then given her return railway ticket and told to await further orders.

5. The recruit's medical certificate is posted by the doctor to the District Selection and Allocation Committee (whose secretary's address will be on the form).

If the recruit is passed as fit for land work the Committee carries out its decision of the interview.

The recruit who is to be sent to a four weeks' training centre will have all particulars, with her address, her medical certificate, her outfit, and measurements, sent to the Committee in the county town.

The Committee will send her instructions and a railway voucher. Her progress will be reported upon, and, if satisfactory, arrangements will be made to place her upon a farm as soon as she is ready. An endeavour will be made to place her locally. In all cases when the recruit is placed at work the district village registrar, or a welfare worker appointed for the purpose, will visit her, and should any difficulty arise try to meet her.

Women's Work on the Land.

THE following Circular Letter, dated 30th March, 1917, was issued by the Food Production Department of the Board to the County War Agricultural Executive Committees :—

SIR,—Now that the Women's Branch of the Board of Agriculture has been more fully organised, I beg to send you information as to the work at headquarters and throughout the country. The Branch has been made responsible as a section of the Food Production Department for the selection, training, and placing of the women who volunteer for land work under the National Service Scheme. Certain benefits are offered by the Government to the selected volunteers, such as free outfit, free instruction and maintainance, railway and travelling expenses in connection with employment, and maintenance at a hostel in between employment. To ensure efficient organisation for the work the Women's War Agricultural Committee in each County is asked to set up :—

An Executive with the following sub-Committees.

(i.) A County Selection and Allocation Committee with subsidiary Committees in the County Districts.

(ii.) An Instruction and Depot Committee.

(iii.) A Finance Committee.

(iv.) A Wages Committee.

Twelve Travelling Inspectors have been appointed for England and Wales, and attached to each county is a paid Organising Secretary, for whose work the Travelling Inspector is responsible.

The County Selection and Allocation Committee is charged with the work of :—

(*a*) Co-operating in the closest way with the Employment Exchanges.

(*b*) Selecting the National Service and other volunteers, arranging for their medical inspection and the provision of their outfit ; for placing them through the County Instruction and Depot Committee into Training Centres, or straight on a farm with the Government allowance of 15*s*. a week for three weeks, paid to them while they are being instructed in their work by the farmer who afterwards employs them. This Committee also inspects the posts and arranges accommodation.

The Instruction and Depot Committee arranges for the training of the volunteers in various ways, in Agricultural Colleges and in Training Centres. It also organises a Depot to which the land workers can be sent if they are out of employment through no fault of their own. The outfit in some cases will be stored at the Depot ; in other cases, a storeroom under the management of voluntary workers will be arranged.

The Finance Committee and its Treasurer, who must be approved by the Board of Agriculture, will make arrangements for the disbursements of such Government money as has been asigned to the use of the Women's War Agricultural Committee.

The Wages Committee shall meet and decide upon the fair current rate of wages for different types of work in the county. It is important that representatives of the War Agricultural Committee should join this Committee.

The existing organisation in the different counties, whereby District Representatives and Village Registrars have been appointed, is being strengthened.

Under the Treasury Grant it will be possible to appoint four Group Leaders in each county, who shall organise groups of part-time village women, go out themselves at the start, and, when moving to another centre, shall leave behind them a forewoman from among the village workers.

The Women's War Agricultural Committees are being asked to send forward the names of local farm workers, suitable to act as Group Leaders.

In consultation with the Department of National Service the Women's Branch is now arranging for a series of meetings in the county towns, for the issue of leaflets, and for Press propaganda, whereby women will be shown the present need of the country for increased food production, the appeal of the Government for their services, and the terms and conditions under which they can enrol in the Women's Land Army.

Every care will be taken that only suitable women are selected for farm work. Once selected, and instructed in the rudiments of the work, the help of the War Agricultural Committees must be secured to see that the women are employed. It is of the utmost importance, therefore, that the Men's and Women's County Agricultural Committees should work in close co-operation.

Attached is a list* of the Travelling Inspectors and Organising Secretaries now appointed, together with a copy of the card issued to women land workers by the National Service Department.

I am, etc.,

MERIEL L. TALBOT,
Director, Women's Branch,
Food Production Department.

MISCELLANEOUS.

Wool of the 1917 Clip: Arrangements for Purchase by the Government.

The following Notice has been issued by the War Department :—

The War Department desire to bring to the notice of farmers an Order made by the Army Council on 5th April (see below), under the Defence of the Realm Regulations, which prohibits all private dealings in wool grown in Great Britain, Ireland, or the Isle of Man, during the season 1917, and cancels all contracts that may have been made for the purchase of such wool.

As last year, the entire clip will be purchased for the Government by the Director of Army Contracts. The following arrangements have been made for England and Wales :—

* Not here printed.

1. *Purchase.*—For the purpose of the collection of the clip, Great Britain will be divided into the same areas as last year with one exception, namely, that the counties of Derby, Notts, and Lincoln, instead of forming a separate area, will be included with the county of Yorkshire. Each area will be in charge of a District Executive Officer, who will superintend purchases on behalf of the Government. The District Executive Officer will be advised by a small committee, consisting of equal numbers of the leading merchants and farmers in the area. The leading merchants purchasing in each area will act as the agents for the Department for the purpose of collecting the wool.

2. *Price.*—The basis of prices has been fixed at 50 per cent. above the average prices ruling in June–July, 1914. A central price list for England and Wales, and local price lists for each area, are in course of preparation and will be published shortly.

3. *Census.*—For the purpose of collecting the wool, all holders of wool of the 1917 clip are required to fill up a Census Form giving information as to the number of their fleeces and where they are situated, and to return this Form to the District Executive Officer before 28th May. All such persons should have received Census Forms before 14th May, and any holder of raw wool who has not received a Form by that date should communicate at once with the District Executive Officer or with the local police, and ask for a copy.

4. *Delivery.*—In accordance with the terms of the Order, all holders of wool are required to sell and deliver all wool in their possession to the persons specified to them by or on behalf of the Director of Army Contracts. Any person refusing to sell or deliver his wool when so instructed, will render himself liable to prosecution. Farmers should not send in their wool to any authorised buyer until they receive instructions from the District Executive Officer as to when and where they should deliver it. All holders of small lots of under 50 fleeces (Wales, 200 fleeces) will be instructed to deliver before 31st July.

5. *Interest.*—Interest at the rate of 5 per cent. will be paid as from 1st September to all persons who are instructed to deliver their wool after that date.

Any communications on the subject of the purchase of the 1917 Wool Clip should be addressed either to the District Executive Officer for the area, or to the Director of Army Contracts, Raw Materials Section, Imperial House, Tothill Street, Westminster, S.W. 1.

Sale of Wool Order.

The following order, dated 5th April, has been issued by the Army Council :—1. No person shall sell raw wool grown or to be grown on sheep in Great Britain, Ireland, and the Isle of Man during the season of 1917, including fleece wool and skin wool, but not including daggings, locks, brokes and fallen wool, otherwise than to persons authorised by or on behalf of the Director of Army Contracts.

2. No person shall make or take delivery of or payment for any wool of the description aforesaid otherwise than in accordance with the provisions of this Order, whether in pursuance of any contracts entered into prior to the date hereof or otherwise.

3. All persons having in their custody or control any stocks of wool of the description aforesaid are hereby required to sell such wool to any persons authorised by or on behalf of the Director of Army Contracts as may be required by him or on his behalf, and to make deliveries to such persons in such quantities and at such times and places as may be specified by him or on his behalf.

4. No person shall mix or wind in any fleeces of the description aforesaid any brokes or dead wool, locks, dagging, or other matter whatsoever.

Control of Sheep and Lamb Pelts.

THE following Order, dated 9th April, has been issued by the Army Council:—The Army Council hereby require all persons engaged in the purchase or sale of pelts and wool skins taken from sheep or lambs killed in Great Britain to comply with the following Regulations from 16th April, 1917, until further notice: 1. No person shall purchase, sell, or make or take delivery of or payment for pelts of the description aforesaid at prices exceeding those set out in the Schedule hereunto annexed.

2. No person shall, without a permit issued by or on behalf of the the Director of Army Contracts, split or frise any pelt of the description other than extras of 10 lb. weight and upwards.

3. All persons engaged in splitting lamb or sheep skins or in dressing or tanning lamb skins, sheep skins or skiver or chamois leather shall furnish such particulars as to their business as may be required from time to time by or on behalf of the Director of Army Contracts.

SCHEDULE.

Sheep Pelts.						*Lamb Pelts.*					
English.			*Scotch.*			*English.*			*Scotch.*		
	s.	*d.*		*s.*	*d.*		*s.*	*d.*		*s.*	*d.*
Extras ..	4	6	Primes ..	3	8	Supers ..	2	8	Primes	2	5
1sts ..	3	6	Light			1sts ..	2	2	2nds ..	1	2
2nds ..	2	4	Primes			2nds ..	1	1			
3rds ..	1	2	and 2nds	3	0						

Cargo of Superphosphate at Hull.

THE following Notice, dated 1st May, has been issued by the Food Production Department of the Board:—

In view of the existing shortage of phosphatic fertilisers, the Director-General of Food Production has arranged for the importation into Hull of a cargo of some 4,500 tons of 30 per cent. superphosphate. The intention is that this shall be placed in farmers' hands at once for the benefit of the present season's crops, and to ensure its speedy distribution the manufacturers of fertilisers named below have agreed to deliver parcels *ex* this cargo at a price of £6 per ton, in bags, net cash in one month, delivered to consumers' station. Farmers should lose no time in placing their orders with one or other of the distributing firms, viz.:—

The Farmers' Company, Ltd., Barton-on-Humber.
G. H. Anderton, Ltd., Howden, Yorks.
The Goole Tillage Company, Goole.

(*Copies of the following Notice in poster form for displaying in the barn, stable or cowshed can be obtained on application to the Secretary of the County War Agricultural Executive Committee.*)

DEFENCE OF THE REALM.

TO FARMERS, HORSEMEN, STOCKMEN, LABOURERS.

Grow all the food you can. Save all the food you can. Do not give things men can eat, such as oats, barley or maize, to farm animals except when absolutely necessary. You must do with far less corn, meal and cake than you have been accustomed to give to your live-stock. Ships cannot be spared to bring you the usual supplies. Every handful grown or saved is a bullet used to good purpose in the great fight for freedom and justice.

Horses.—Give your horses enough food to keep them up to their work, but no more. Some horses need less than others; cut down their food and save the oats. Horses should always be turned out to grass when possible.

Milch Cows.—Full supplies of milk are necessary. Feed your milking cows well, but make the best use of green-stuffs and save cake and meal. Remember that a poor milking cow needs less food than a good milker. Do not give cake or meal to cows while they have plenty of good grass.

Other Cattle.—With other cattle a great saving of food must be made. No cake or meal should be given to store stock. Cattle should be sent to the butcher less fat than has been usual; prime beef is now an unpatriotic luxury.

Sheep.—Sheep and lambs should be kept on grass, roots, green-crops, hay and straw, with very little, if any, cake or corn, and sent for slaughter early.

Pigs.—Pigs should be fed on grass, green-stuffs, roots, whey, acorns, beech-nuts, scraps, and waste, and finished if necessary with a very little meal.

Poultry.—Keep no poultry except breeding stock and good layers. None should be fattened for table. Let your poultry live, as far as possible, on grass, stubbles and waste food.

The Germans are trying to starve us out; submarines are their last hope of escaping defeat. The success of our Army and Navy and the life of the Empire depend on the supply of food. Let there be no waste at home. No one wants compulsory rations either for man or beast. Good will and good sense can make them unnecessary. Do your part and there will be

NO FOOD-CARDS FOR ANIMALS.

(Signed) R. E. PROTHERO.

Provision of Sprayers and Spraying Materials.

In order to assist allotment holders, cottage gardeners and small cultivators generally to protect their potato crops from attack by disease, the Department is making preparation for the provision of knapsack sprayers and spraying materials.

Societies and associations and groups of private individuals will be able to purchase a knapsack sprayer and enough material for spraying their potato crops. Free instruction will be given to purchasers in the use of a knapsack sprayer.

For particulars of the scheme applications should be made to the Director of Horticulture, Food Production Department, 72, Victoria Street, London, S.W. 1.

Rabbits and Rooks.

THE following Circular, dated 7th April, 1917, has been issued by the Food Production Department of the Board to War Agricultural Executive Committees in England and Wales :—

SIR,—The attention of this Department has been drawn to the danger caused by rabbits to the maintenance of the food supply. By Regulation 2R of the Defence of the Realm (Consolidation) Regulations, 1914, very wide powers have been conferred upon the Board of Agriculture to take such action as in their opinion may be necessary for the purpose of preventing injury to crops or trees or wastage of pasturage by rabbits and birds of various descriptions. Before, however, putting these powers into execution, it is desired that the landlords and shooting tenants should have an opportunity of so reducing the numbers of rabbits as to minimize the danger of injury to crops. Your Committee should, therefore, take all steps that may be possible to induce the landlords and shooting tenants to destroy the rabbits and to prevent their injuring the crops and pasturages, as they are now doing in many parts of the country. They should be asked to allow farming tenants to place traps in the banks of woodlands, on either side of the bank.

Another matter which causes anxiety is the damage done in various counties by the large number of rooks now in existence. County Executive Committees should use their influence with owners of rookeries to allow the birds to be reduced by one or other of the following methods.

The best method is to shoot the young rooks just before they are old enough to fly from the breeding places. If, however, shooting cannot easily be arranged, the nests should be destroyed or the rooks should be scared off their nests during any cold nights in the incubating season by lighting fires, firing guns, or otherwise ; this method should be followed for two or three nights in succession, and would be sufficient to prevent the eggs from hatching.

Should your Committee find that a sufficient reduction of rabbits cannot be obtained with the voluntary co-operation of owners and shooting tenants, they are requested to furnish this Department with a report on the subject, in order that it may be considered whether the compulsory powers referred to should be put into active operation.

I am, etc.,

ARTHUR LEE,
Director-General.

THE following Memorandum, dated 7th April, 1917, has been issued by the Food Production Department of the Board to County Executive Committees in England and Wales :—

Rats and Sparrows. Attention is called to the great increase of rats and house sparrows in many parts of the country, and to the depredations committed upon crops by these pests. It is most important that every practicable means of conserving the national food supply should be adopted.

The arrangements for destruction which commend themselves to the Board of Agriculture and Fisheries are as follows :—

(1) The formation of rat and sparrow clubs as recommended in the Leaflet No. 84, issued by the Board of Agriculture and Fisheries ;

(2) The appointment of a professional rat-catcher at a fixed weekly wage ;

(3) The offering of rewards to other persons at rates which should not exceed :—

1*s.* per dozen rats' tails ;
3*d.* ,, heads of fully-fledged house sparrows ;
2*d.* ,, ,, unfledged house sparrows ;
1*d.* ,, house sparrows' eggs.

If rewards are offered, great care must be taken to prevent fraud. Competent persons should be appointed who would be responsible for making the payments, and for ensuring that the tails, heads and eggs brought in are destroyed as soon as the reward has been paid, and are not taken away by the payee or by any other person, and they should be authorised to withhold payment and report any case in which there might be reason to suspect fraud.

If school children are set to work on the destruction of sparrows they should not be allowed to claim rewards, unless the work has been done under the direct supervision of the schoolmaster or schoolmistress ; rewards for the destruction of rats should not be given to school children.

It should be borne in mind that the sparrow that does injury to crops and that requires to be destroyed is the common house sparrow.

While it is considered that the bulk of the expenditure can and should be defrayed by persons interested or from voluntary sources, no objection will be raised by the Local Government Board to reasonable expenditure by district or parish council or parish meetings in England and Wales which desire to assist in this work being defrayed outof the funds at their disposal. In view of the need for economising paper it has been thought inadvisable to send a circular to the large number of authorities concerned, and it will not be necessary for the authorities to communicate with the Department on the subject.

THE following Circular Letter, dated 11th April, 1917, has been addressed by the Director-General of Food Production to War Agricultural Executive Committees in England and Wales :—

Rats and Sparrows.

SIR,—A Memorandum has been sent to you, which has been prepared by this Department in conjunction with the Local Government Board, with regard to the destruction of rats and house sparrows. It will be observed that, while it is considered that the expense of destroying these pests should in general be borne

by those interested, no objection will be raised to expenditure for this purpose being made out of the rates by urban and rural district councils, parish councils and parish meetings, provided the work is done according to one or more of the methods described in the Memorandum. A notice to the same effect has been published in the Press.

County Executive Committees should use their influence to induce the council or parish meeting of any area in which rats or house sparrows constitute a danger to crops to take active steps for their destruction.

Leaflet No. 84, which is referred to in the Memorandum, is being reprinted, and copies will be sent to you as soon as possible.

I am, etc.,

ARTHUR LEE,
Director-General.

Licences to Procure Lead Shot.

THE following Memorandum, dated 7th April, 1917, was issued by the Food Production Department of the Board to War Agricultural Executive Committees in England and Wales :—

The accompanying model form of licence* for the supply of cartridges containing lead shot for the destruction of vermin and the preservation of crops is circulated. The Committees should arrange to print the number of forms likely to be required.

The Executive Committee should prepare a list of reliable firms who supply shot-gun ammunition in the county, and should arrange with those firms to note in the space provided for the purpose that the number of cartridges licensed has been supplied, and to return the licence to the Executive Committee when that has been done. A list of approved firms should be printed on the back of the licence, or in any other convenient space. The weight of shot per cartridge, and the number of cartridges licensed should be stated in each licence issued.

It is not necessary to confine the issue of these licences to farmers, but care should be taken only to license those persons to obtain cartridges who require them *bona fide* for the preservation of crops. It is not intended to license supply of cartridges in order to destroy vermin for the preservation of game.

Manufacture of Lead Shot for Cartridges.

THE following Circular Letter, dated 3rd April, 1917, was addressed by the Food Production Department to War Agricultural Executive Committees in England and Wales :—

SIR,—I am directed to say that in order to restrict the manufacture of lead shot as far as possible, the Ministry of Munitions have decided only to grant sanction for its manufacture in cases where cartridges are required for the destruction of vermin or the preservation of crops.

County Executive Committees are empowered to issue licences, which should be signed by the Chairman of the Committee, to farmers who require to be supplied with cartridges for these purposes. Such licences should only be granted when it is considered to be absolutely necessary for the protection of crops that the farmer should be supplied with the

* Not here printed.

cartridges required. The licence should state the number of cartridges authorised by the Committee and should specify the description of shot to be supplied.

I am to ask that County Executive Committees will confine the issue of licences to the supply of the number of cartridges which is strictly necessary for the purpose named.

I am, etc.,
F. L. C. FLOUD,
Assistant Secretary.

THE following Memoranda, dated 30th April, have been addressed to the Agricultural Executive Committees by the Food Production Department of the Board :—

Shots and Cartridges for Protection of Crops from Animal Pests.

The Department have taken up with the Priority Branch of the Ministry of Munitions the question of supplies of shot and cartridges to dealers for the purpose of sale to persons who have received licences from Agricultural Executive Committees to purchase shot or cartridges for the preservation of crops. It is understood that there are sufficient stocks in the country both of loose shot and cartridges to meet present demands ; and that the arrangement for the supply of these to dealers are being conducted by the Priority Branch of the Ministry of Munitions through two trade associations.

Any dealers who ask for the help of the Agricultural Executive Committee in order to obtain shot or cartridges for the above purpose should be advised to apply either to :—

The Gunmakers' Association (1912), Ltd. (F. B. Bosworth, Secretary), 23, St. Swithin's Lane, London, E.C. ; or to,

The Ironmongers' Association (R. H. Smith, Secretary), Apsley House, Priory Road, Sheffield.

THE Priority Branch of the Ministry of Munitions are receiving numerous applications for permits for the purchase of wire-netting.

Wire-netting.

No such permit is required. Although manufacture is not permitted, arrangements have been made to enable wire-netting to be purchased from stock if required for protecting the food crops, or for sheep-netting, but for no other purpose.

IN view of the necessity of increasing our arable area by the breaking up of pastures, it has been considered desirable by the Board to publish a review of the situation with regard to grass land in this country, including an account of recent experiments bearing on the subject. To this end the Board have issued as a Supplement to the May *Journal* a Memorandum by Mr. R. G. Stapledon, M.A., entitled " Grass Land and Ploughed Land." After classifying and describing the various types of grass land, Mr. Stapledon deals with the possibility of their improvement by good management, and by bringing them into the rotation. Directions are also given for the choice and purchase of seed mixtures.

Journal Supplement on Grass Land and Ploughed Land.

The Supplement will be sent free to subscribers to the *Journal* on written application, and may be obtained by non-subscribers for 4*d*. post free from 3, St. James' Square, London, S.W. 1.

MISCELLANEOUS NOTES.

Notes on Crop Prospects Abroad.

The *International Crop Report and Agricultural Statistics* for April, 1917, issued by the International Institute of Agriculture, contains particulars of the production of cereal crops in the Southern Hemisphere in 1916-17.

Wheat.—In Argentina, Australia, and New Zealand the total production is placed at 28,456,000 qr. in 1916-17, against 44,911,000 qr. in 1915-16, a decrease of 36·6 per cent.

Oats.—In the above-mentioned countries the production is estimated at 6,086,000 qr. in 1916-17, compared with 10,750,000 qr. in 1915-16, a reduction of 43·4 per cent.

Maize.—The production in Argentina and Australia is estimated to amount to 7,854,000 qr. in 1916-17, against 19,587,000 qr. in 1915-16, a decrease of 59·9 per cent.

Sowing of Winter Cereals in the Northern Hemisphere.—The areas estimated to have been sown with winter *wheat* in 1916-17, compared with the areas sown during the corresponding period of 1915-16, expressed as percentages, are as follows: Denmark 93, Spain 103, France 85, England and Wales 86, Scotland 87, Switzerland 105, Canada 82, United States 102, India 109, Japan 100; with *rye*—Denmark 95, Spain 99, France 90, Switzerland 105, United States 121; with *barley*—Spain 89, France 110, Switzerland 106, Japan 88; with *oats*—Spain 98, France 95, United States 79.

British India.—The total production of wheat in 1917 is estimated at 46,322,000 qr., or an increase of 16·6 per cent. compared with 1916, when it amounted to 39,739,000 qr., while the area sown was greater by 9·4 per cent.

France.—According to an official report the conditions of the crops on 1st April was as follows (figures for 1st April, 1916, in brackets for comparison): Winter wheat, 54 (69); rye, 62 (70); winter barley, 56 (71); and winter oats, 52 (70). (80 = good, 60 = fairly good, 50 = passable). (*London Grain, Seed and Oil Reporter*, 1st May.).

Canada.—The High Commissioner for Canada, in a report dated 3rd May, states that in some districts of Southern Alberta 75 per cent. of the wheat sowing has been completed.

United States.—According to a report issued by the Statistical Bureau of the Department of Agriculture, the condition of winter wheat on 1st May was 73·2, compared with 63·4 on 1st April, 1917, and 82·4 on 1st May last year. The area of winter wheat on 1st May was estimated at 27,653,000 acres, or 31 per cent. less than the area planted in the autumn, and 7,000,000 acres less than the area harvested last year. The condition of rye was 88·8 compared with 86·0 on 1st April, and 88·7 on 1st May, 1916. About 72·4 per cent. of the spring ploughing was completed by 1st May, compared with 70·4 per cent. in 1916 and 78·3 per cent. in 1915, whilst 58·7 per cent. of the spring planting was done by 1st May. (*London Grain, Seed and Oil Reporter*, 8th May).

Agricultural Conditions in England and Wales on 1st May.

THE Crop Reporters of the Board, in commenting on agricultural conditions in England and Wales on the 1st May, state that the cold and snow hindered work on the land for nearly two-thirds of April. The last ten days were, however, very favourable, and good progress was made everywhere; the land worked very well, and a good seed-bed was almost universally obtained. Wheat, on the whole, is rather a poor plant; that sown early in the autumn is mostly satisfactory, but the later-sown is not promising, and some fields have had to be re-sown. Winter oats have been a good deal damaged. Spring corn is only just showing in many districts, and it is early to speak of its prospects; though it appears to be mostly satisfactory. The area under oats is expected ultimately to be 8 or 9 per cent. greater than last year; but a considerable area, both of this crop and barley, still remains to be sown in the northern districts more particularly. Beans and peas seem fairly satisfactory, though beans have in some cases suffered from the frost.

Considerable progress has been made with potato planting in the south and in Lincolnshire, but much less in the north, and in some places, in fact, it has hardly begun. The work is being carried on under very favourable conditions.

Seeds have suffered a good deal from the severe weather in the north, and some fields have been ploughed up. They are now starting to grow, however, and prospects are fairly satisfactory generally in the south. With better weather, a considerable improvement may be looked for.

Pastures are very bare, and hardly commenced to grow before the end of the month. Owing to the prolonged cold, winter keep was getting very short, and live stock generally were only in poor condition.

The fall of lambs was generally about average, or perhaps even somewhat over, but the severe weather caused considerable losses, except in some favoured southern counties. Losses occurred also among the ewes, and as the trying conditions rendered their condition generally rather poor, there were many complaints of shortage of milk, which was partly responsible for the mortality among the lambs. Hill flocks had a particularly trying time owing to the lateness of the season, and they suffered considerable losses.

Agricultural Labour in England and Wales during April.

Northumberland, Durham, Cumberland, and Westmorland.—The supply of labour is very short, and at the recent hirings wages rose considerably. Great help has been given by soldiers in many districts.

Lancashire and Cheshire.—Labour is generally short, but the deficiency has to some extent been made good by the employment of soldiers, women and children.

Yorkshire.—The deficiency in the supply of labour is now being much felt, especially as regards horsemen in the East Riding, but the situation has been considerably relieved by the use of soldier labour.

Shropshire, and Stafford.—The supply of labour is very short, but welcome assistance has been given by soldiers and women.

Derby, Nottingham, Leicester, and Rutland.—The supply of labour is deficient, but soldiers and women are affording great help.

Lincoln and Norfolk.—With military help the supply of labour is just about sufficient to carry on necessary work.

Suffolk, Cambridge, and Huntingdon.—The supply of labour is deficient. The help of soldiers has been very beneficial, and has eased matters considerably.

Bedford, Northampton, and Warwick.—The supply is deficient, but the assistance given by soldiers and women has been of great service to farmers generally.

Buckingham, Oxford, and Berkshire.—There is still a general deficiency, but good help has been rendered by soldiers and women.

Worcester, Hereford, and Gloucester.—Labour is generally deficient, but the shortage has been met by the employment of soldiers and female labour, which has proved of great service.

Cornwall, Devon, and Somerset.—The supply of labour is generally short, but the deficiency has been met to a large extent by the employment of soldiers, women and school-children. Wages show an upward tendency.

Dorset, Wiltshire, and Hampshire.—The supply of labour is short, but the employment of women and the release of soldiers for agricultural work has greatly relieved the situation.

Surrey, Kent, and Sussex.—Labour is generally short and horsemen and stockmen difficult to obtain. Considerable assistance has been rendered by the military and by women, which has mitigated the general deficiency.

Essex, Hertford, and Middlesex.—The supply continues to be scarce, especially temporary labour.

North Wales.—With the help of soldiers the labour situation has not been critical, but still farm workers are scarce.

Mid-Wales.—Great assistance has been given by soldiers and women, but the supply of labour is still short.

South Wales.—The temporary release of soldiers for farm work has been of great assistance to farmers, and the fine weather has enabled good use to be made of this help, but otherwise the supply of labour is very deficient.

Prevalence of Animal Diseases on the Continent.

THE following statement shows that according to the information in the possession of the Board on 1st May, 1917, certain diseases of animals existed in the countries specified :—

Denmark (*month of February*).—Anthrax, Foot-and-Mouth Disease, Swine Erysipelas, Swine Fever.

France (*for the period 18th March—7th April*).—Anthrax, Blackleg, Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever.

Holland (*month of March*).—Anthrax, Foot-and-Mouth Disease, Foot-rot, Glanders and Farcy, Swine Erysipelas.

Italy (*for the period 26th March—1st April*).—Anthrax, Black-leg, Foot-and-Mouth Disease (647 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever.

Norway (*month of March*).—Anthrax.

Russia (*month of October*).—Anthrax, Cattle-plague, Foot-and-Mouth Disease (50,680 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Sweden (*month of March*).—Anthrax, Black-leg, Swine Fever.

Switzerland (*for the period 19th—25th March*).—Black-leg, Swine Fever.

No further returns have been received in respect of the following countries: Austria, Belgium, Bulgaria, Germany, Hungary, Montenegro, Rumania, Serbia, Spain.

The Weather in England during April.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
Week ending 7th April:								
England, N.E. ...	32·9	—10·2	0·71	18	+11	5	4·0	—1·6
England, E.	35·7	—8·2	0·70	18	+11	5	4·6	—1·0
Midland Counties ...	34·8	—9·3	0·49	12	+ 3	3	4·9	—0·1
England, S.E. ...	36·8	—8·8	0·91	23	+15	5	4·5	—1·0
England, N.W. ...	34·2	—9·9	0·52	13	+ 2	4	4·7	—0·5
England, S.W. ...	36·6	—8·6	0·76	19	+ 6	5	5·8	+0·7
English Channel ...	40·2	—7·3	0·66	17	+ 7	5	6·3	+1·3
Week ending 14th April:								
England, N.E. ...	37·5	—6·4	0·70	18	+ 8	7	4·6	+0·4
England, E.	37·7	—7·0	0·65	16	+ 6	6	4·6	—0·6
Midland Counties ...	37·5	—7·2	0·84	21	+11	6	5·4	+0·7
England, S.E. ...	38·8	—7·0	0·77	20	+11	6	5·5	+0·2
England, N.W. ...	37·0	—7·3	0·99	25	+13	6	4·3	—0·7
England, S.W. ...	38·6	—7·2	0·79	20	+ 7	6	6·0	+0·5
English Channel ...	41·7	—6·3	0·86	22	+12	6	6·8	+0·5
Week ending 21st April:								
England, N.E. ...	41·5	—3·2	0·40	10	+ 2	4	4·8	—0·4
England, E.	41·5	—4·3	0·56	14	+ 7	4	4·5	—1·1
Midland Counties ...	43·1	—2.7	0·31	8	0	3	5·2	+0·2
England, S.E. ...	44·2	—2·7	0·35	8	+ 1	3	4·7	—1·1
England, N.W. ...	43·1	—2·7	0·56	14	+ 4	4	5·0	—0·5
England, S.W. ...	44·4	—2·3	0·31	8	— 3	4	6·8	+1·2
English Channel ...	46·5	—1·2	0·14	3	— 7	3	7·8	+1·2
Week ending 28th April:								
England, N.E. ...	46·5	+0·5	0·02	1	—10	1	3·1	—2·2
England, E.	44·2	—3·2	0·00	0	—12	0	5·1	—0·3
Midland Counties ...	47·6	+0·1	0·00	0	—13	0	2·5	—2·9
England, S.E. ...	45·6	—2·8	0·00	0	—14	0	6·5	+0·4
England, N.W. ...	47·1	0·0	0·00	0	—14	0	4·1	—1·1
England, S.W. ...	48·0	—0·1	0·00	0	—19	0	2·3	—2·8
English Channel ...	47·8	—2·1	0·00	0	—14	0	10·2	+4·5

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(*From the Returns of the Board of Agriculture and Fisheries.*)

DISEASE.	APRIL.		FOUR MONTHS ENDED APRIL.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	50	53	230	221
Animals attacked	54	59	265	260
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	24
Glanders (including Farcy):—				
Outbreaks...	1	2	9	21
Animals attacked	5	4	19	62
Parasitic Mange:—				
Outbreaks	186	161	1,201	1,162
Animals attacked	392	350	2,543	2,824
Sheep-Scab:—				
Outbreaks	26	16	348	165
Swine Fever:—				
Outbreaks	287	445	840	1,523
Swine slaughtered as diseased or exposed to infection	148	1,315	344	4,691

IRELAND.

(*From the Returns of the Department of Agriculture and Technical Instruction for Ireland.*)

DISEASE.	APRIL.		FOUR MONTHS ENDED APRIL.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	—	—	2	1
Animals attacked	—	—	2	5
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—	—	1	—
Parasitic Mange:—				
Outbreaks	1	6	16	28
Sheep-Scab:—				
Outbreaks	27	28	193	200
Swine Fever:				
Outbreaks	50	41	108	100
Swine slaughtered as diseased or exposed to infection	374	236	741	530

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES in April and March, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	April. First Quality.	April. Second Quality.	March. First Quality.	March. Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	17 0	16 3	17 5	16 4
Herefords	16 9	15 5	16 9	15 7
Shorthorns	16 11	15 8	17 0	15 9
Devons	17 1	15 6	16 9	15 5
Welsh Runts	16 11	15 0	17 0	15 5
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	15¼	13½	—	—
Sheep :—				
Downs	15½	14¼	15¼	14
Longwools	14¼	13¼	14¾	13½
Cheviots	16¾	15½	16¼	15¼
Blackfaced	16¾	15¼	15¾	14½
Welsh	16	14½	15½	13¾
Cross-breds	15¾	14¼	15½	14¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	16 1	15 2	15 10	15 0
Porkers	16 8	15 10	16 6	15 9
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	41 18	33 5	41 18	33 3
,, —Calvers ...	40 1	31 15	38 12	30 9
Other Breeds—In Milk ...	43 1	31 17	43 1	31 17
,, —Calvers ...	27 10	26 0	29 10	27 0
Calves for Rearing	3 12	2 16	3 10	2 15
Store Cattle :—				
Shorthorns—Yearlings ...	16 18	14 18	17 0	14 18
,, —Two-year-olds...	26 14	22 16	26 11	23 0
,, —Three-year-olds	35 12	29 11	34 9	28 10
Herefords —Two-year-olds...	30 5	24 5	29 2	23 9
Devons— ,,	28 9	23 12	30 18	25 16
Welsh Runts— ,,	25 18	23 1	25 19	22 14
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	70 7	61 11	73 9	62 3
Store Pigs :—				
8 to 12 weeks old	36 3	28 3	35 11	27 7
12 to 16 ,, ,, ...	59 7	46 8	60 7	47 6

* Estimated carcass weight.

AVERAGE PRICES OF DEAD MEAT at certain MARKETS in ENGLAND in April, 1917.

(Compiled from Reports received from the Board's Market Reporters).

Description.	Quality.	Birmingham.	Leeds.	Liverpool.	London.	Manchester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—						
English	1st	120 0	116 0	123 6	118 6	118 6
	2nd	115 6	113 0	114 6	113 6	111 0
Cow and Bull	1st	111 6	110 0	106 0	105 0	105 0
	2nd	106 0	106 0	86 6	100 6	95 6
Irish: Port Killed	1st	—	116 6	117 0	116 6	115 0
	2nd	—	111 0	108 6	111 6	109 6
Argentine Frozen—						
Hind Quarters	1st	—	—	—	102 6	—
Fore ,, ...	1st	—	—	—	93 6	—
Argentine Chilled—						
Hind Quarters	1st	106 0	105 6	106 6	105 0	106 6
Fore ,, ...	1st	95 0	95 6	95 0	93 6	95 0
American Chilled—						
Hind Quarters	1st	—	—	—	107 6	—
Fore ,, ...	1st	—	—	—	94 6	—
VEAL :—						
British	1st	130 6	116 6	116 0	125 0	—
	2nd	118 0	105 6	94 6	106 0	101 6
Foreign...	1st	—	—	—	—	—
MUTTON :—						
Scotch	1st	128 6	127 0	147 0	137 6	147 0
	2nd	123 6	118 0	128 6	128 6	142 6
English...	1st	126 0	127 0	140 0	129 6	135 6
	2nd	120 0	118 0	123 0	120 0	122 6
Irish: Port Killed	1st	—	—	134 0	—	135 6
	2nd	—	—	119 0	—	126 0
Argentine Frozen	1st	115 6	—	113 0	110 0	113 0
New Zealand ,, ...	1st	86 6	—	87 6	87 6	87 6
Australian ,, ...	1st	—	—	—	—	—
LAMB :—						
British	1st	149 6	143 0	154 0	151 6	149 6
	2nd	140 0	—	144 6	142 6	140 0
New Zealand	1st	100 6	—	98 0	98 0	98 0
Australian	1st	100 6	—	98 0	98 0	98 0
Argentine	1st	135 6	—	127 0	127 0	127 0
PORK :—						
British	1st	137 6	130 6	132 0	133 0	132 0
	2nd	129 6	121 6	116 6	120 0	121 6
Frozen	1st	102 6	105 6	105 0	103 0	107 6

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at certain MARKETS in ENGLAND in April, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	—	—	—	—	23 6	22 6
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery—Fresh	—	—	203 0	199 0	—	—
,, Factory	—	—	189 0	186 6	—	—
Danish	—	—	215 6	212 6	214 6	209 6
French	—	—	—	—	217 0	212 0
Dutch	—	—	—	—	208 0	202 0
American	—	—	—	—	—	—
Australian	210 0	207 6	206 6	201 6	199 0	193 0
New Zealand	218 6	215 0	215 6	212 0	211 6	206 6
Argentine	—	—	208 0	205 6	198 0	193 6
CHEESE ;—						
British—						
Cheddar	168 0	165 0	170 0	165 0	165 0	—
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	169 0	156 0	176 6	—
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	162 0	160 0	162 0	160 0	162 0	—
BACON ;—						
Irish (Green)	143 6	—	145 0	143 0	142 6	139 0
Canadian (Green sides)	136 6	—	136 0	—	136 6	134 6
HAMS :—						
York (Dried or Smoked)	—	—	—	—	190 0	180 0
Irish (Dried or Smoked)	—	—	—	—	160 0	156 0
American (Green) (long cut)	128 0	124 0	129 0	—	129 6	126 6
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	—	—	—	—	20 5	18 11
Irish	19 4	—	19 6	18 6	19 10	18 10
Egyptian	13 0	—	12 10	11 7	14 0	13 0
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Arran Chief	—	—	—	—	242 0	—
Edward VII.	—	—	—	—	242 0	—
Evergood	—	—	—	—	242 0	—
HAY :—						
Clover	—	—	150 0	140 0	140 6	131 6
Meadow	—	—	—	—	139 6	130 6

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1915, 1916 and 1917.

Weeks ended (*in* 1917).	WHEAT.						BARLEY.						OATS.					
	1915.		1916.		1917.		1915.		1916.		1917.		1915.		1916.		1917.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	46	2	55	8	76	0	29	7	47	8	66	4	26	5	31	5	47	1
,, 13 ...	48	9	56	7	75	8	30	5	48	6	65	7	27	6	31	11	47	2
,, 20 ...	51	6	57	2	75	8	31	3	49	6	64	9	28	10	32	6	47	4
,, 27 ...	52	8	58	0	75	10	32	5	51	0	64	5	29	10	32	11	47	8
Feb. 3 ...	53	3	58	3	75	10	33	7	52	5	64	0	30	3	32	4	47	3
,, 10 ...	54	8	57	6	76	0	34	7	52	10	63	5	31	1	32	2	46	11
,, 17 ...	56	0	56	11	76	3	34	11	53	6	63	8	31	5	31	9	47	3
,, 24 ...	56	0	58	2	76	9	35	3	54	2	63	9	31	8	32	2	47	8
Mar. 3 ...	55	11	59	4	77	4	34	6	55	7	64	0	31	8	32	4	48	0
,, 10 ...	54	8	58	2	78	0	33	5	55	6	63	7	31	0	32	3	48	7
,, 17 ...	53	9	57	9	78	10	32	2	55	4	64	1	30	7	31	10	49	4
,, 24 ...	54	3	55	11	80	3	31	11	54	6	65	6	30	6	31	4	50	4
,, 31 ...	54	6	53	6	81	5	31	9	53	8	71	10	30	6	30	5	51	10
Apl. 7 ...	54	9	51	8	84	4	31	3	53	7	69	11	30	4	30	1	55	1
,, 14 ...	55	4	53	2	85	2	30	10	53	1	71	10	30	5	30	7	57	2
,, 21 ...	56	5	55	3	84	10	31	5	52	10	70	6	30	11	31	8	59	8
,, 28 ...	58	3	56	3	81	1	32	7	53	5	69	5	31	5	32	4	58	6
May 5 ...	60	5	55	7	77	7	33	3	53	1	64	4	32	4	32	10	54	9
,, 12 ...	61	7	55	5	78	0	34	0	53	5	64	11	32	5	33	1	55	2
,, 19 ...	62	0	55	0			34	1	52	10			32	8	33	0		
,, 26 ...	61	11	54	7			34	8	52	9			32	7	33	4		
June 2 ...	61	9	53	3			35	4	53	9			32	5	33	3		
,, 9 ...	60	1	51	2			34	5	52	8			32	4	32	7		
,, 16 ...	56	1	48	10			34	3	50	9			31	9	32	1		
,, 23 ...	52	0	47	6			34	4	49	10			31	9	31	3		
,, 30 ...	49	5	46	3			35	3	49	1			31	1	30	10		
July 7 ...	50	1	46	3			34	7	45	6			31	6	30	8		
,, 14 ...	52	7	48	11			35	8	47	5			31	6	31	6		
,, 21 ...	53	10	51	6			35	10	48	8			32	1	32	3		
,, 28 ...	55	3	53	5			36	1	47	2			31	1	32	5		
Aug. 4 ...	55	4	55	1			35	7	46	1			31	5	32	9		
,, 11 ...	55	2	56	7			37	0	46	11			31	7	31	2		
,, 18 ...	54	3	58	1			39	4	48	0			31	4	30	8		
,, 25 ...	51	11	59	0			38	3	47	1			30	0	31	6		
Sept. 1 ...	45	3	59	4			38	1	48	5			26	10	30	5		
,, 8 ...	43	0	59	3			37	11	51	7			26	8	31	1		
,, 15 ...	42	9	59	11			39	0	52	6			26	4	30	9		
,, 22 ...	43	3	59	4			39	8	53	3			26	1	30	9		
,, 29 ...	43	5	58	10			40	4	54	1			26	5	31	1		
Oct. 6 ...	44	1	59	2			41	0	54	5			26	5	30	9		
,, 13 ...	45	9	59	7			42	3	53	10			27	1	31	6		
,, 20 ...	48	2	60	9			44	0	53	8			28	1	31	11		
,, 27 ...	50	3	62	10			46	2	54	6			29	1	32	10		
Nov. 3 ...	51	6	66	7			47	3	56	2			30	4	34	0		
,, 10 ...	52	8	69	8			47	5	58	0			30	11	35	8		
,, 17 ...	53	6	70	9			47	11	59	8			31	3	37	8		
,, 24 ...	54	2	70	8			48	7	61	8			31	1	39	7		
Dec. 1 ...	53	7	71	3			48	11	63	1			30	11	41	4		
,, 8 ...	52	10	72	1			47	10	65	6			30	4	44	1		
,, 15 ...	53	11	73	2			47	5	66	5			30	6	45	10		
,, 22 ...	53	10	74	8			47	2	67	3			30	7	46	5		
,, 29 ...	54	9	75	10			47	5	67	5			30	10	47	4		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of April, 1915, 1916, and 1917.

	WHEAT.			BARLEY.			OATS.		
	1915.	1916.	1917.	1915.	1916.	1917.	1915.	1916.	1917.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
London ...	56 11	53 11	86 2	32 9	52 8	71 8	32 2	33 7	59 10
Norwich ...	54 7	53 4	82 6	30 5	51 2	68 10	30 6	31 3	57 0
Peterborough	55 8	53 7	82 7	30 3	51 7	66 7	30 11	31 6	58 11
Lincoln ...	56 5	55 5	83 8	30 10	54 3	69 4	30 8	31 5	58 1
Doncaster ...	54 11	53 1	84 11	30 0	54 8	70 1	29 3	30 0	56 9
Salisbury ...	53 8	53 5	82 7	31 11	50 10	68 6	31 7	30 9	57 4

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

McCall, A. G.—Field and Laboratory Studies of Soils. An Elementary Manual for Students of Agriculture. (77 pp.) New York: J. Wiley & Sons; London: Chapman & Hall, 1915. 2*s.* 6*d.* net. [63.11(02).]

Giltner, W.—Laboratory Manual in General Microbiology. (418 pp.) [Laboratory of Bacteriology, Hygiene and Pathology, Michigan Agricultural College.] New York: J. Wiley & Sons; London: Chapman & Hall, 1916. 10*s.* 6*d.* net. [576.8.]

Rastall, R. H.—Agricultural Geology. (331 pp.) [Cambridge Geological Series.] Cambridge: University Press, 1916. 10*s.* 6*d.* net. [55; 63.111.]

Jones, E., and *Griffith, J. J.*—Chemistry for Rural Schools. (184 pp.) London: Blackie & Son, 1916. 2*s.* 6*d.* net. [54(02).]

Graham, P. A.—Reclaiming the Waste. (175 pp.) London: "Country Life" Offices, 1916. 3*s.* 6*d.* net. [63.12.]

Dannatt, W.—Practical Hints from the Notebook of an Old Farmer. (85 pp.) London: "The Field and Queen" (Horace Cox), 1914. 3*s.* 6*d.* net. [63(022).]

Field Crops—

Holmes, E. M.—Medicinal Herbs: Their Cultivation and Preparation in Great Britain. (12 pp.) [Extracted from the Journal of the Royal Horticultural Society, Vol. xlii.] London: W. Wesley & Son, 1916. 6*d.* [63.348.]

Chamberlain, Mrs. T., and *Wheelwright, Miss E. C.*—Herb-collecting for Boys and Girls. (8 pp.) London: The Herb-growing Association, 1916. 2*d.* [63.348.]

Teetgen, Ada B.—Profitable Herb Growing and Collecting. (180 pp.) London: "Country Life," 1916. 3*s.* 6*d.* net. [63.348.]

Horticulture—

Wyldon, H.—Sugarless Jam-making: Fruit and Vegetable Bottling and Corn Syrup Preserves. (24 pp.) London: Polsue, 1916. 1*s.* net. [664.85.]

Nanot, J., et *Gatin, C. L.*—Le Séchage des Fruits et des Légumes. (324 pp.) Paris: Libraire Agricole de la Maison Rustique, 1916. Fr. 3.50. [664.85.]

Emptage, W. F.—Commercial Fruit Growing on the Small Holding. (62 pp.) London: "The Fruit Grower" [1916]. 1*s.* 6*d.* net. [63.41(02).]

University of Leeds and the Yorkshire Council for Agricultural Education.—Bull. 103:—The Making and Management of an Allotment. (39 pp.) 1916. 3*d.* [63.5(04).]

Rowles, W. F.—The Food Garden. (324 pp.) London: Headley Bros. [1916.] 6*s.* net. [63.51(02).]

Plant Diseases—

Ealand, C. A.—Insect Enemies. (223 pp.) London: Grant Richards, 1916. 6*s.* net. [63.27(02); 59.16.]

Live Stock—

Trolet, G.—Le Cheval Percheron. (77 pp.) Nogent-le-Rotrou: G. Fauguet, 1907. [63.61(04).]

West of Scotland Agricultural College.—Bull. 77:—Report on Experiment on the Feeding of Pigs carried out at Calderwood Estate, East Kilbride. (81–98 pp.) Glasgow, 1916. [63.64.]

Dairying and Food, General—

Winton, A. L., Moeller J., Winton, K.B.—The Microscopy of Vegetable Foods, with Special Reference to the Detection of Adulteration and the Diagnosis of Mixtures. [2nd edition.] (701 pp.). New York: J. Wiley & Sons; London: Chapman & Hall, 1916. 27*s.* 6d. net. [578; 614.3.]

Long, J.—Modern Dairy Farming. (131 pp.). London: "The Bazaar, Exchange and Mart," [1916]. 1*s.* net. [63.70 (02).]

West of Scotland Agricultural College.—Research Work on Hard-Pressed Cheese. (10 pp.) Glasgow, 1916. [63.736.]

West of Scotland Agricultural College.—Bull. 76:—Report on the Result of Experiments on A.—The Feeding of Dairy Cows on Pasture; B.—The Yield and Composition of Cow's Milk during Lactation; C.—The Changes in the Composition of Cheddar Cheese during the Process of Ripening. (15–78 pp.) Glasgow, 1916. [63.711; 63.736.]

Birds, Poultry, and Bees—

Hanson, S. G.—Commercial Egg Farming from Practical Experiences gained over a Period of Years. (62 pp.) London: Constable & Co. [1916.] 1*s.* net. [63.651(04).]

Jasper, Madame.—The Flemish System of Poultry Rearing. (174 pp.) London: "Country Life," 1916. 3*s.* 6*d.* net. [63.651(04).]

Hurst, J. W.—Poultry Farming for Beginners. (175 pp.) London: Baillière, Tindall & Cox, 1916. 3*s.* 6*d.* net. [63.65(02).]

Phillips, E. F.—Bee-keeping. (457 pp.) New York: The Macmillan Company, 1916. 8*s.* 6*d.* net. [63.81(02).]

Stanton, Blanche H.—Poultry Lore for the Small-holder. (80 pp.) London: St. Catherine Press, 1916. 1*s.* net. [63.651(04).]

Gillard, J. T.—Profuse Egg Production. (21 pp.) Hull, 1916. 1*s.* net. [63.651(04).]

Forestry—

Gibson, H. S.—A Treatise on Forest Engineering. (60 pp.) Calcutta, 1914. 9*d.* [69(02).]

Webster, A. D.—Tree Wounds and Diseases: Their Prevention and Treatment, with a Special Chapter on Fruit Trees. (215 pp.) London: Williams & Norgate, 1916. 7*s.* 6*d.* net. [63.24–49; 63.49–2.]

Roth, F.—Michigan Manual of Forestry. Vol. I. Forest Regulation. (218 pp.) Ann Arbor, Michigan, published by the Author, 1914. [63.49–19; 63.49(021).]

Roth, F.—Michigan Manual of Forestry. Vol. II. Forest Valuation. (171 pp.) Ann Arbor, Michigan, published by the Author, 1916. [63.49: 31; 63.49(021).]

Webster, A. D.—British Grown Timber and Timber Trees. (164 pp.) London: Rider & Son, 1916. 5*s.* net. [63.49–198.]

Engineering—

Cleghorne, W. S. H.—Farm Buildings and Building Construction in South Africa. (325 pp.) London: Longmans, Green & Co., 1916. 21*s.* [69(02).]

Economics—

Haggard, Sir R.—The After-War Settlement and Employment of Ex-Service Men in the Oversea Dominions [Report to the Royal Colonial Institute.] (68 pp.) London: St. Catherine Press, 1916. 3*d.* net. [331; 325.]

Gray, H. B., and *Turner, S.*—Eclipse or Empire? (316 pp.) London: Nisbet & Co., 1916. 2*s.* net. [33.]

Cooper, Sir W. Earnshaw.—British Industries after the War. I. The Land Industry. (52 pp.) London: Central Committee for National Patriotic Associations, 1916. 3*d.* post free. [338.1]

Surveyor's Institution.—Unemployment after the War. Part II. Rural. [Report of a Special Committee of the Council.] (51 pp.) London: Surveyors' Institution, 1916. [331.]

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POTATO SPRAYING FOR FARMERS.

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At the present time a considerable acreage of potatoes is being grown by farmers who have not hitherto had experience of the crop on a large scale. The potato crop is liable to be very severely damaged by the fungous disease known as "blight" or "potato disease." A serious loss of potatoes from this cause took place last year. Farmers who have made a special study of potato-growing know well that the spraying of the crop is a necessary and profitable operation, and in the great potato-growing districts of Lincolnshire and Scotland, potato-spraying takes a regular place in the ordinary routine of annual cultivations.

The growing of a full crop of potatoes is now more than ever a national duty, and there is every indication that farmers generally are anxious to adopt the practice of spraying. The objects of the present article are (1) to record the main results of the spraying experiments carried out on the farm of the South-Eastern Agricultural College, Wye; and (2) to describe for farmers the best way to make and apply those mixtures which have proved to be certain preventives of potato "blight."

Cause of Potato "Blight."—The life-history of the particular fungus (*Phytophthora infestans*) which is the cause of potato-"blight" can only, from considerations of space, be very briefly dealt with here. If, however, the farmer obtains at the outset a clear idea of the way the fungus begins its attack on the potato plant each season, the way it spreads, and how it is that spraying saves the crop, he is far more likely to remember to spray at the right time and to do the job thoroughly, than if, without understanding the facts of the case, he carries out the operation more as an act of faith.

As is well known, the " blight " is first noticeable in the form of dark-coloured spots or blotches on the leaf or stem. In the southern parts of England this usually occurs about the middle of July. The potato " haulm " thus affected becomes rapidly—if the weather is warm, wet and " muggy "—more and more diseased and blackened, and begins to emit a smell like that of bad fish, until finally it is completely destroyed, or, if the weather becomes drier, shrivels up (Figs. 1–5). When the " haulm " is thus destroyed (which may happen, with main-crop varieties, as early as the end of August), not only is all further increase of the crop prevented, so that only a small crop is obtained, but the potatoes in the ground become diseased and show discoloured blotches on the outside, and in the flesh a rusty-brown layer just under the skin (see Fig. 6).

The cause of the disease in both the " haulm " and the tuber is the same minute fungus, which under certain conditions is just visible to the naked eye. If a potato-leaf bearing patches of " blight " is examined early in the morning after a warm, " muggy " night the fungus may be seen clearly, on the under-surface of the leaf, as a greyish-white " mould " or " mildew," surrounding the edges of the diseased spot (see Fig. 2). Now, at this stage of its development the potato " blight " fungus (the spawn or *mycelium* of which is living in, and killing, the tissues of the leaf) produces myriads of very minute " seeds," called *spores*. These are borne on little branches which protrude from the under-surface of the leaf, giving the appearance there of a greyish-white " mould," as noted above. Each single *spore* is capable of infecting a healthy potato leaf, and producing a fresh centre of disease w thin a few hours. If no spraying has been done, and the weather conditions are suitable, the *spores* thus produced rapidly infect the surrounding plants and the disease spreads extremely rapidly. Many of the *spores* produced on the diseased " haulm " fall to the ground, and reach the growing tubers and infect them, with the result that a large proportion of the crop may prove to be " blighted."

The disease can easily be prevented by spraying the crop in time. The potato-grower plants each season a certain proportion of " seed " tubers containing some " spawn " of the fungus in them, and no practicable method is known of killing the fungus in the tuber. Such infected tubers give rise to shoots on which the first spots of " blight " for the season appear. Though the farmer cannot prevent the appearance of the " blight " fungus on a few isolated plants in the field,

he can entirely prevent the spread of the *spores* from the first-formed disease-spots. If the potato-plants surrounding these early outbreaks of "blight" have been thoroughly sprayed with a copper-containing fungicide, the *spores* instead of being able to attack fresh places and infest the crop generally, are killed, and the spread of " blight " is definitely stopped for the season. The good effect of spraying the potato crop has been repeatedly demonstrated by experiments carried out in many parts of England, and particularly by the valuable work in Ireland carried out by the Irish Department of Agriculture.

Potato-Spraying Experiments at Wye College.—Spraying experiments have been carried out on the farm at Wye College for several consecutive seasons. As will be seen from the figures given below, the spraying resulted in a very substantial increase in the crop of sound tubers.

In 1908 a field of potatoes (Up-to-Date) was sprayed twice with " Bordeaux mixture " (made of copper sulphate *i.e.* " bluestone " and quicklime). A plot was left unsprayed. In this year the " blight " appeared early, and the weather conditions were such that it spread rapidly and soon blackened and destroyed the " haulm " in the unsprayed part of the field. By 31st August, the stalks in the unsprayed plot were leafless, brown, and practically dead, while the plants in the rest of the field which had been sprayed were green and vigorously growing (see Fig. 7). A careful search in July had established the fact that the " blight " fungus made its first appearance on as many plants in the sprayed part of the field as in the unsprayed part, *but owing to the " haulm " there being covered by the spray it was not able to spread as it did in the unsprayed plot.* It is in such seasons as this, when the " blight " appears early and spreads rapidly that the greatest benefit results from spraying. The figures obtained, calculated on an acreage basis, were as follows :—

	Tons	*cwt.*	*qr.*
Sprayed (twice), Sound	12	5	0
,, Blighted	1	13	1
Total crop	13	18	1
Unsprayed, Sound	4	19	0
,, Blighted	4	3	1
Total crop	9	2	1

Summary of Results.—The total increase of crop per acre due to spraying twice was 4 tons 16 cwt.; the increase of sound tubers per acre was 7 tons 6 cwt.

In 1909 seven plots of $\frac{1}{4}$ acre of the Dalhousie variety, were twice sprayed with the following mixtures :—

3 plots with Bordeaux mixture,
3 plots with Burgundy mixture (copper sulphate and washing soda),
1 plot with Woburn Bordeaux Paste.
One plot was left unsprayed.

The attack of "blight" was medium in intensity. The results obtained were as follows :—

	Tons	*cwt.*	*qr.*
Bordeaux mixture (average of 3 plots), Sound ..	12	2	2
,, ,, Blighted .	0	11	1
	12	13	3
Burgundy mixture (average of 3 plots), Sound ..	12	8	2
,, ,, Blighted	0	16	1
	13	4	3
Woburn Bordeaux Paste, Sound	10	0	0
,, ,, Blighted	1	19	0
	11	19	0
Unsprayed, Sound	8	11	1
,, Blighted	1	15	3
	10	7	0

Summary of Results.—The total increase of crop per acre due to spraying twice was :—

	Tons	*cwt.*	*qr.*
Bordeaux mixture	2	6	3
Burgundy ,, ...	2	17	3
Woburn Bordeaux Paste	1	12	0
The increase of sound tubers per acre was :—			
Bordeaux mixture	3	11	1
Burgundy ,, ...	3	17	0
Woburn Bordeaux Paste	1	8	3

In 1910 the experiments were devised to test the comparative value of spraying once and spraying twice, and also of spraying "early" and spraying "late." By spraying "early" is meant the completion of the operation before any trace of "blight" has appeared on the "haulm." In the South of England, in an average season, this condition is fulfilled if the spraying (of main crop potatoes) is completed by the second



F[illegible] 1.—First signs of attack; if spraying h[illegible]already been carried out, the disease will not extend further.



FIG. 2.—The three end leaflets are attacked and partly destroyed; the fungus can be seen as a whitish "mould" or "mildew."



F[illegible] 3.—Most of the leaflets are attacked and pa[illegible]y destroyed. In this case it is too late to spray.



FIG. 4.—"Haulm" almost entirely destroyed.

or third week of July. By spraying "late" is meant the application of the spray at a time when the "blight" has just appeared. Bordeaux mixture was used in these trials, and the plots which were duplicated, were ½ acre in extent. A severe attack of "blight" occurred, and in those plots where the disease obtained a hold, many tubers rotted in the ground. The results obtained were as follows:—

		Tons	*cwt.*	*qr.*
Sprayed once "early,"	Sound	9	1	1
„ „	Blighted	0	10	0
		9	11	1
Sprayed once "late,"	Sound	5	10	3
„ „	Blighted	0	3	0
		5	13	3
Sprayed twice,	Sound	10	9	2
„	Blighted	0	4	1
		10	13	3
Unsprayed,	Sound	5	8	3
„	Blighted	0	1	2
		5	10	1

Summary of Results.—The total increase of crop per acre was:—

	Tons	*cwt.*	*qr.*
Plots sprayed once "early"	4	1	0
„ „ "late"	0	3	2
„ twice, "early" and "late"	5	3	2
The increase of sound tubers per acre was—			
Plots sprayed once "early"	4	2	2
„ „ "late"	0	2	0
„ twice	5	0	3

The above figures give clear proof that "late" spraying (after the "blight" has started) is of little or no use, and a waste of time and money. This same fact is shown by the photograph of these sprayed plots (see Fig. 8) in which it can be seen that at a time when the "haulm" of the crop sprayed "early" was vigorous and growing, that of the crop sprayed "late" had been destroyed by the "blight," almost to the extent shown in the unsprayed plot. The figures show also that two sprayings give a higher yield of sound tubers than one spraying. Although no weighings were made, it was clearly apparent that the percentage of ware was highest in the crop which had received two sprayings.

In 1911 a similar set of experiments was carried out, and the results obtained are of particular interest when compared with those obtained in 1910, since in 1911 no "blight" was noticed throughout the growing period. The crop in all the plots consisted of sound tubers only.

Summary of Results—

	Tons	cwt.	qr.
Plots sprayed once "early"	13	6	2
„ „ "late"	13	4	3
„ twice	13	18	0
Unsprayed	12	19	0

The total increase of crop per acre due to spraying twice with Bordeaux mixture in a season when no "blight" appeared was 19 cwt.

It was again noticeable that the percentage of ware was highest in the twice-sprayed crop. The figures obtained were as follows :—

	Twice Sprayed. *Per cent.*	*Unsprayed.* *Per cent.*
Ware	86	77
Seed	11	19
Chats	3	4

In 1913 a trial was made of the method of so-called "dry spraying," which about this date began to be extensively advertised as being superior to "wet spraying." Two proprietary powders, "Herrods Dry Spray" and "Strawsonite" were used, and were thoroughly applied to the crop, at the time when the "haulm" was damp with dew, by means of one of the best distributing machines fitted with powerful bellows. Three applications at the rate of 28 lb. to the acre were given on 9th July, 25th July, and 13th August. Other plots were sprayed with Bordeaux mixture on the same dates, 120 gal. to the acre being given, using a horse-drawn potato-spraying machine (Fig. 9).

The attack of "blight" during this season was not serious. No disease appeared to any serious extent on the "haulm" of any of the plots until late in September. Early in September the "blight" was more noticeable in the "haulm" of the "dry sprayed" plots than in the wet sprayed, and it made more rapid headway. There was also more growth of "haulm" in the wet, than in the dry, sprayed plots.

Summary of Results.—The weights of the blighted tubers were not ascertained. The total crop per acre was as follows :—

	Tons	cwt.	qr.
Wet spray : Bordeaux mixture ..	13	5	2
Dry spray : Herrods Dry Spray ..	12	15	0
„ Strawsonite	12	14	0
Unsprayed	11	19	2



IG. 5.—Haulm entirely destroyed.



FIG. 6.—Potato tubers attacked by "blight."



FIG. 9.—Horse-drawn potato-spraying machine.

There is reason to believe that, in a season when the attacks of "blight" are severe, "dry spraying" is decidedly inferior to wet spraying. The results obtained by Dr. Pethybridge* in Ireland, in a long series of experiments conducted over many consecutive seasons, have led him to prefer "wet spraying" to "dry spraying." From the writer's own experience, he would strongly advise farmers not to trust to "dry spraying" (unless there are special difficulties in obtaining water, or the potato-fields are very hilly), but to use a home-made wet spray, either Bordeaux mixture or Burgundy mixture, either of which may be absolutely relied upon to prevent "blight."

Preparation of the Mixtures for Spraying Potatoes.—There is no difficulty for the farmer in making the mixture for potato-spraying. The operation requires nothing beyond a little careful weighing and measuring. If, however, the mixture could be bought ready-made, it would probably be economical to do so, having regard to the value of the farmer's time and the shortage of labour. It cannot be too emphatically pointed out, however, that the so-called Bordeaux mixtures made by mixing various proprietary powders with water are decidedly inferior both chemically and physically to the home-made mixture; they are liable to choke up the spraying nozzle and to be distributed unequally owing to the heavier sediment, and to adhere less to the "haulm," while the home-made mixture has none of these defects.

The best mixtures for the farmer are *Bordeaux mixture* and *Burgundy mixture*. They are equally efficacious against the "blight," but where quicklime is procurable, Bordeaux mixture is to be preferred, since it has these advantages: It is cheaper; it can be made in a galvanised-iron tank; and it does not require to be tested for safety before being used, since there is no danger of any "scorching" of the "haulm" due to some slight inaccuracy in making. Detailed instructions for making the two mixtures are given below.

Bordeaux Mixture. — Stock solutions of bluestone and quicklime of a strength of 1 lb. to 1 gal. of water should first be made.

Examples.—Take (for instance) a tub to hold 40 gal.; dissolve 40 lb. of bluestone in 40 gal. of water (the bluestone will dissolve within 24 hours in cold water if tied up in sacking and suspended just below the surface of the water). Take another tub to hold 40 gal. and place in it 40 lb. of good quicklime *in lumps* (powdered air-slaked lime is quite useless);

* *Jour, Dept. Agric. and Tech. Instr.*, Ireland, April, 1915, p. 492.

add a few pints of water to moisten the surface of all the lumps, wait for a few minutes until the lumps begin to crack and steam and crumble down; then add a little more water until a thick, creamy paste is obtained. The quicklime is now slaked; add water up to the 40 gal. mark, and a stock solution of lime of the strength of 1 lb. quicklime to 1 gal. water is obtained. The slaked lime on standing will sink to the bottom; the stock solution must, therefore, be stirred vigorously before use.

NOTE.—To economise barrels, a stock solution of bluestone of the strength of 2 lb. to 1 gal. of water may be made; it is *not* advisable, however, to make the lime stock solution stronger than prescribed above.

Formula for Bordeaux Mixture.

Bluestone	14 lb.
Quicklime..	9 ,,
Water	100 gal.

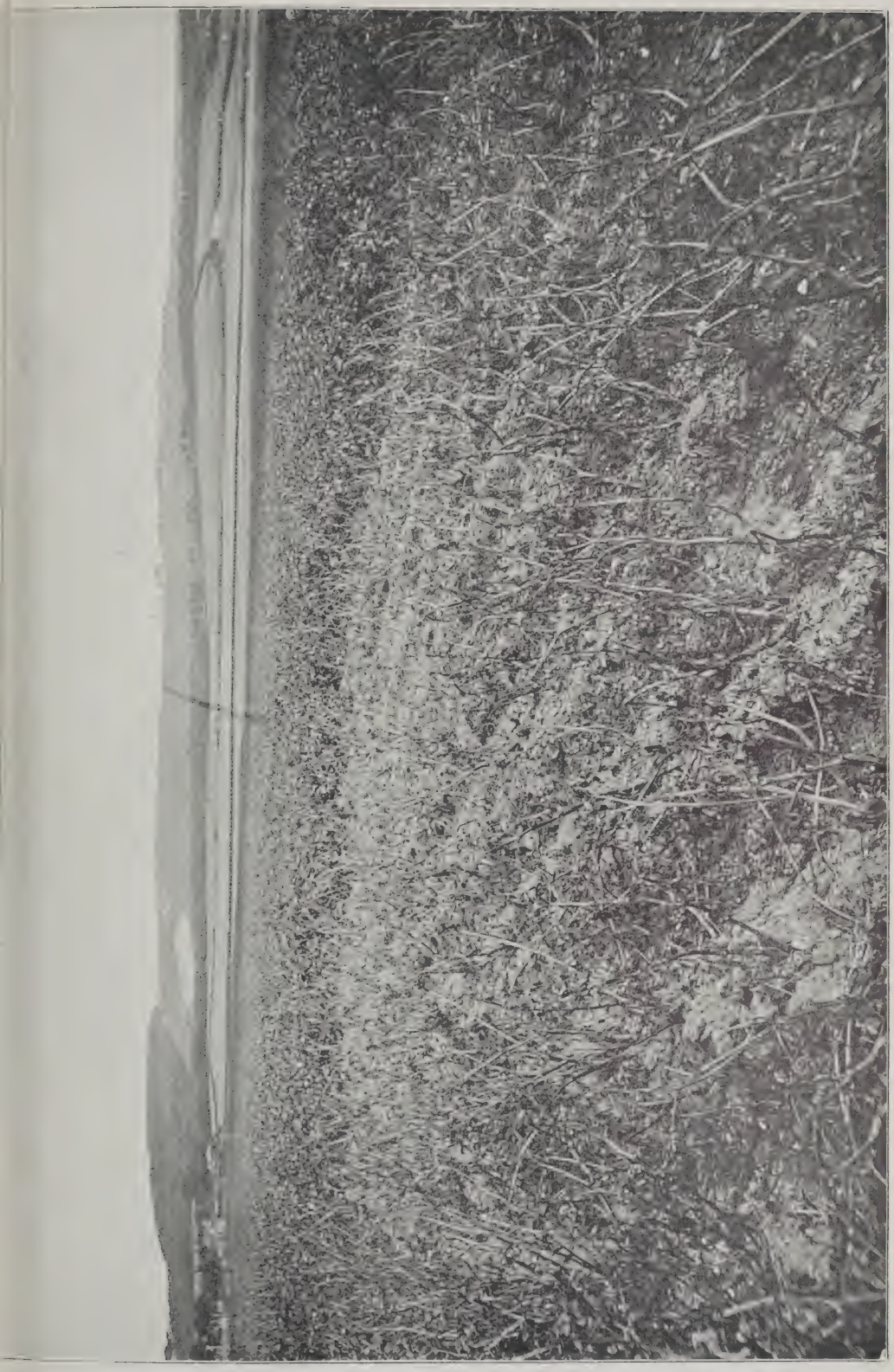
Method of Mixing.—Use the bluestone stock solution at full strength. Dilute the lime stock solution fully with water. Pour the bluestone solution into the diluted lime solution and Bordeaux mixture (of a sky-blue colour) results at once.

Example.—To make 100 gal. of Bordeaux mixture, stir thoroughly the lime stock solution; then take out 9 gal. and pour through a *coarse strainer* (rejecting all lumps) into a galvanised-iron tank or wooden vat. Add 77 gal. of water, thus obtaining 86 gal. of "milk of lime." Stir, and then pour into the midst of the lime 14 gal. of the bluestone stock solution, and Bordeaux mixture is obtained. Stir before use.

By adopting the above method of mixing, not only is a Bordeaux mixture of the best physical quality obtained, *i.e.* one in which the lightest precipitate is formed, but the mixture can be made in a galvanised-iron tank. Although the bluestone solution will affect tin and iron, if it is poured into the middle of the "milk of lime" it is immediately acted upon chemically before it can reach the sides of the galvanised-iron tank. If a galvanised-iron tank of known capacity, and tubs of stock solutions are placed on the headland of the potato field, Bordeaux mixture can be made by the hundred gallons in a very short time. The galvanised-iron tank must be washed out with water after use, or a gradual rusting will occur.

Burgundy Mixture.—Stock solutions of bluestone and washing soda should be made as follows:—

Examples.—Take (for instance) a tub to hold 40 gal.; dissolve 40 lb. of bluestone in 40 gal. of water (the bluestone



—View on 31st August of unsprayed plot in corner of a field sprayed twice with Bordeaux mixture. n the unsprayed plot the "haulm" was brown and practically dead; in the rest of the field it was green and growing vigorously, and the crop increasing. (See page 267 for further details).

will dissolve within 24 hours in cold water if tied up in sacking and suspended just below the surface of the water). The stock solution will then be of the strength of 1 lb. bluestone to 1 gal. water.

Take another tub to hold 40 gal. and dissolve 80 lb. washing soda in 40 gal. water. The stock solution will then be of the strength of 2 lb. washing soda to 1 gal. of water.

Formula for Burgundy Mixture.

Bluestone	14 lb.
Washing soda	17½ „
Water	100 gal.

Method of Mixing.—Use the washing soda stock solution at full strength. Dilute the bluestone stock solution fully with water. Pour the washing soda solution into the bluestone solution, and Burgundy mixture (of a sky-blue colour) results at once.

Example.—To make 100 gal. Burgundy mixture. Measure out as carefully as possible 14 gal. of the bluestone solution into a wooden tub or vat (tin, iron, or galvanised vessels must not be used); add 77¼ gal. water. Into this diluted bluestone solution pour slowly, stirring the while, 8¾ gal. (carefully measured) of the washing soda stock solution (=17½ lb. washing soda). A chemical change takes place at once, and Burgundy mixture is formed.

The mixture must now be tested. A packet of blue litmus papers (price 1*d.*) is obtained from the chemist. If the directions given above have been followed, a piece of blue litmus paper dipped into the Burgundy mixture will not change colour and the mixture is safe to use. If, however, the blue colour changes to pink, the mixture is acid and unsafe to use (it will burn the leaves). Such a mixture can be made safe by adding and stirring in a little more of the washing soda stock solution until the blue litmus paper no longer turns pink.

NOTE.—The bluestone (copper sulphate) used may be either powdered or in crystal form; it must be of not less than 98 per cent. purity. The bluestone solution is poisonous (but not caustic to the hands) and should be kept where animals cannot drink it. While the stock solutions mentioned above can be kept safely for several months, both Bordeaux and Burgundy mixture when once made should be used within 24 hours, as afterwards a chemical change takes place, and the mixtures deteriorate. Both mixtures should be poured through a fine copper gauze strainer into the spraying machine, and then no stoppage of the nozzles occurs.

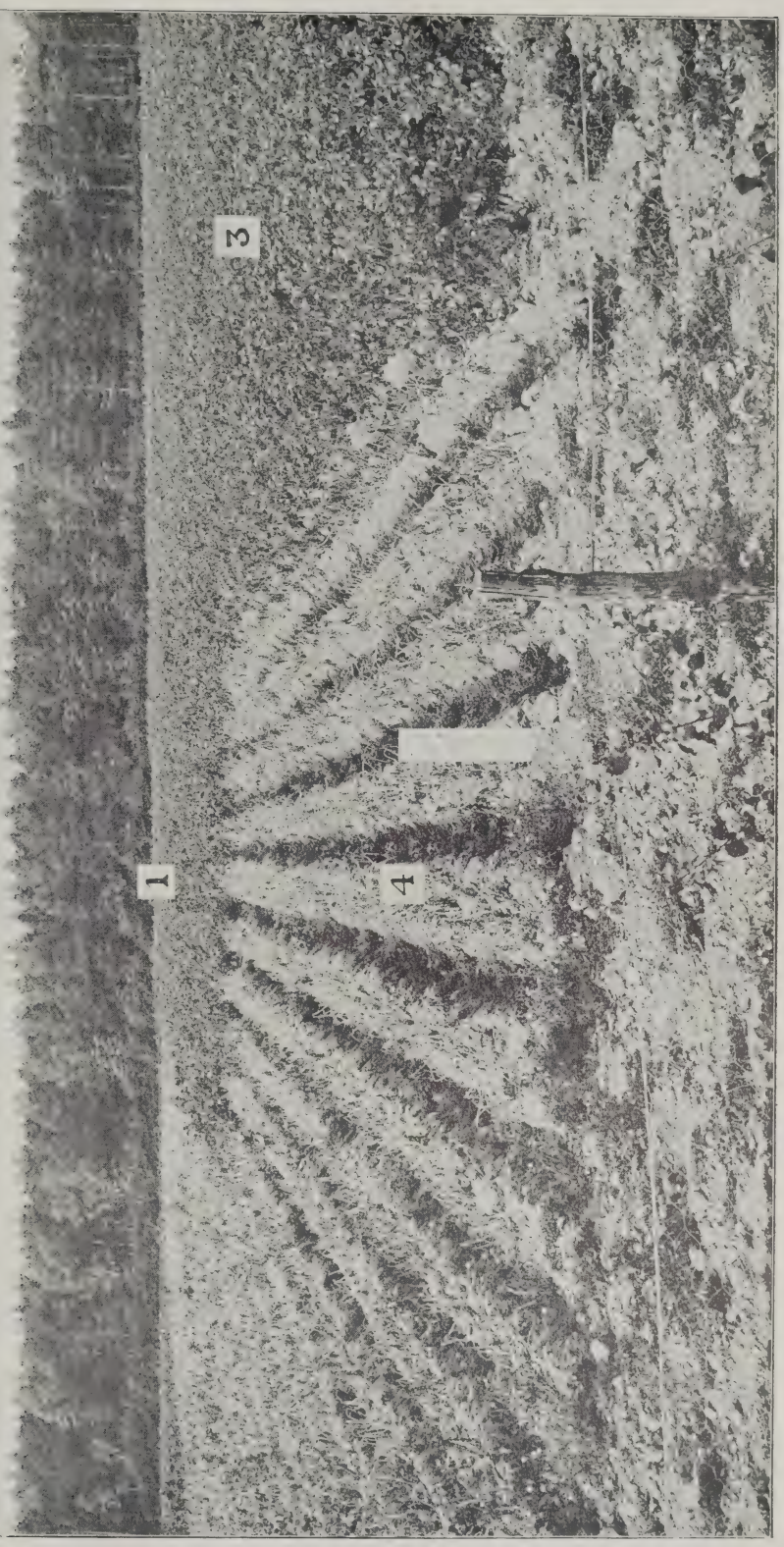
Time and Method of Application of the Mixture.—In the South of England second earlies (such as British Queen and Mayfield Blossom) should be sprayed during the first week of July; main crop varieties should be sprayed in the second or third week of July, according to the weather. The writer has repeatedly seen farmers wait to put in the spraying machine until the "blight" was apparent, whereas *in every case the first spraying should be given before the disease has appeared.* Main crop varieties should be given a second spraying three weeks or a month later. Many experienced potato-growers believe that a third spraying is profitable.

The one essential in spraying potatoes is that the mixture is applied in a finely-divided "misty" spray to both the under and upper surfaces of the leaves. If this is done, and the mixture once allowed to dry on, it will be found that heavy rain will not wash off the deposit formed.

For a large acreage, the horse-drawn spraying machine is certainly to be recommended. Several different machines of the type shown in Fig. 9 are on the market. All the spraying in the experiments on the College Farm, the results of which are given above, was done with this machine. These machines, if a slow-walking horse is employed, can be adjusted to put on 120 to 140 gal. to the acre, and the maximum quantity should be aimed at. From 10 to 15 acres per day can be sprayed.

For a small acreage, excellent results are obtained with the knapsack sprayer.* Several good types are on the market. The man spraying must be instructed to keep up the pressure at the nozzle, and to place the nozzles first near the ground and spray upwards so that the under-surface of the leaf is wetted, then, holding the spraying-rod above the crop, the upper surface is sprayed. From 150 to 200 gal. to the acre should be given. If a gang of men is employed, with an extra man for mixing and for filling up the knapsacks, one man can spray about 1 acre a day.

* See p. 367.



G 8.—Spraying experiments with Bordeaux mixture, 1910; general view, 9th September. sprayed once, "early"; Plot 2 (much blighted), sprayed once, "late"; Plot 3, sprayed twice; Plot 4, (haulm destroyed by "blight"), unsprayed. (See page 269 for further details.)

REPORT ON THE POSSIBILITY OF CONSERVING SURPLUS PLUMS BY DRYING.

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IN response to a request by the Board of Agriculture an enquiry was commenced at Wye College during the autumn of 1916, into the possibility of drying plums as a means of conserving the surplus supplies of this fruit which frequently occur in England. When considering this proposition it became evident to us that the main problems to be dealt with were to ascertain (*a*) whether there could be produced from Victoria plums a marketable article which would be comparable with the dried products coming on to our markets from abroad, and (*b*) whether a product of this kind can be best prepared by drying in a vacuum machine, or by the more general methods which involve the use of currents of hot air.

It was essential to keep in mind the fact that the successful drying of plums in this country is mainly dependent upon a knowledge of how to deal with a glut of fruit occurring over a short period of the year. From this point of view, rapid drying is of paramount importance, more especially for the purpose of evaporating the fruit down to such a degree of dryness that it may be put aside for a time while fresh material is being dealt with.

In reviewing the literature dealing with fruit and vegetable drying, a good deal is to be found relating to plum-drying. The methods employed may be classified broadly as follows :—

(*a*) Sun-drying.
(*b*) Evaporation by artificial heat.
(*c*) Evaporation and subsequent treatment
(*d*) Pruning, or slow stewing followed by evaporation.

With regard to the first of these it is obvious that in the autumn our climate is unsuitable for drying fruit by heat from the sun.

Evaporation by artificial heat, without further treatment, has frequently been advocated in this country as a means of conserving both fruit and vegetables, and a good deal of detail is on record relating to drying on this plan by means of currents of hot air and by heating in evacuated chambers. By far the greater amount of attention in the past, however, has been

given to the former of these two methods of artificially drying fruit. With regard to the second method, the information available amounts to little more than descriptions of machinery, the practical details of the process being only briefly referred to.

One of the difficulties encountered when developing the method of simple evaporation by artificial heat is that the product obtained differs somewhat widely in colour, texture and flavour from the usual article on the market, and it appears that under normal circumstances of trade no market can be developed for dried plums of this kind in competition with the superior article coming from abroad. These foreign supplies of dried plums are mostly obtained by submitting the ordinarily dried product to some subsequent process which brings about a change in the colour and flavour of the fruit. No details of the processes for effecting these changes are to be found, probably owing to a close secrecy maintained on the part of the manufacturers, and it has been necessary to devote a good deal of attention to this part of the problem.

Far more information is available with regard to the pruning of plums than to their evaporation but, when considered as a method of dealing rapidly with large quantities of fruit during a short time, it is obvious that this method of preserving suffers from the disadvantage that considerable time is necessary for carrying out the early stages of the process. This delay in producing a product capable of being handled, practically precludes the adoption of the usual process of pruning for the purpose in view.

These considerations have prompted us to proceed along the following lines of enquiry :—

(1) A study of the rapid drying of the harvested plums in order to reduce them to a condition in which they will keep without deterioration until the plum harvest is over.

(2) Working out the conditions best suited for drying plums (*a*) by means of currents of hot air (hot air machines), and (*b*) by heating them under reduced pressure (vacuum machines).

(3) Comparison of Victoria plums with other varieties used for drying to discover whether there is any inherent quality of the Victoria plum which would prevent the success of a process which has been found suitable in the case of other varieties.

(4) The elaboration of some method for converting the dried Victoria plums into an article likely to meet the demand of the market.

Preliminary Treatment.—When considering the question of rapidly drying vegetable material, it seemed obvious that the nature of the moisture retaining surface of the substance to be dried will influence largely the rate at which evaporation can take place. From this point of view, it appeared that fully ripe fruit would dry more rapidly than unripe or partially ripe fruit; indeed, any preliminary treatment which will render the outer skin more pervious should assist in hastening the drying of the fruit. One finds several writers who advocate submitting the fruit to a certain preliminary treatment which, it is claimed, changes the nature of the outer skin, so that the plums lose moisture more rapidly than when drying is carried out without such treatment.

The methods usually recommended for effecting this change are (1) Dipping in hot solutions, (2) Steaming for a few minutes, and (3) Pricking the skin.

Comparative trials of these preliminary operations have been made and other means have been tried for bringing about the same result.

(1) *Dipping.*—This consists of using a hot solution of 1 or 2 per cent. carbonate of soda or potash, in which the plums are dipped for various periods ranging from one to six minutes. It has been claimed for this process that in addition to hastening the subsequent drying of the fruit, it renders the skin less easily broken during the earlier stages of evaporation and so prevents the plums from splitting. Our experience has been that little or no advantage is derived from this practice as the plums are still very easily damaged and no appreciable hastening of the drying could be established; in fact the conclusion come to is that this dipping may actually retard the drying of the plums without giving any compensating advantage when handling them.

As an example of our experience it may be mentioned that when partially ripe Czar plums were submitted to this dipping process and then dried, the product obtained presented a dull appearance compared with that obtained when no such treatment was adopted, and no hastening of the drying process was observed. Indeed, in the case of ripe Victoria plums, the dipped fruit suffered greatly when handled and the drying process was retarded, as may be seen from the following data: 15 lb. Victorias dipped in a hot 1 per cent. solution of carbonate of soda, and then evaporated for 12 hours between 70° and 80° C., weighed 4 lb. 8 oz.; and after 18 hours 1 lb. 14 oz. The same quantity of the same sample of plums, without this treatment,

after drying under the same conditions for 12 hours, weighed 2 lb. 11 oz., and after 16 hours their weight was 1 lb. 9 oz.

(2) *Steaming.*—Experiments to test the value of this process were carried out with several varieties of plums, *i.e.* Belle de Louvain, Yellow Magnum, Monarch and Victoria, all of which were used at different stages of ripeness as it was thought probable that the value of such treatment might vary with the degree of ripeness of the fruit. Our experience showed this to be so, preliminary steaming exercising a maximum beneficial effect when the fruit is not fully ripe.* As typical of the evidence obtained the examples given in Table I. may be cited. Some difficulty was experienced in getting uniform steaming throughout the bulk of plums; those nearest the steam inlet becoming over-steamed and damaged before those occupying the centre of the mass were affected at all. It is probable, however, that this difficulty could be largely overcome in practice.

TABLE I.—*The Influence of Steaming on the Subsequent Drying of Plums.*

Material.	Condition of Drying.	Weight after Drying.	
		Steamed.	Control.
Monarch—		lb. oz.	lb. oz.
Unripe, 15 lb.	12 h. at 70°–80° C.	5 6	5 7½
	18 h. ,,	2 11	2 12
Yellow Magnum—			
Mod. ripe, 15 lb. ..	12 h. ,,	4 14	5 2½
	18 h. ,,	2 5	2 8
Victoria—			
Mod. ripe, 15 lb. ..	6 h. ,,	8 10	9 6
	12 h. ,,	3 3	4 5
	18 h. ,,	1 14	1 10
Victoria—			
Fully ripe, 15 lb. ..	12 h. ,,	4 4	2 11
	18 h. ,,	1 13	1 9

(3) *Pricking.*—Experiments were carried out on similar lines with pricked and non-pricked plums. The main difference observed with the pricked plums was that a considerable amount of fruit juice was lost during drying, and after evaporation the plums presented a more glossy appearance and were rather sticky.

(4) *Other Methods.*—These collective results indicated the desirability of experimenting with other methods of rendering the skin of the fruit more pervious to water vapour, as it is

* See footnote on p. 280.

obvious that without some such treatment the operation is a very long one. With this object in view various substances, such as benzene, ether and chloroform, were used, the plums being submitted to the vapour of these substances and preliminary observations being made, on the amount of fluid which drained from them after such treatment.

The results of these laboratory trials made it evident that these vapours had the desired effect, particularly chloroform, which showed promise of being a useful medium for quickening the drying process. Accordingly, trials were made by submitting weighed quantities of plums to the vapour of chloroform in a closed vessel for 30 minutes prior to drying them (Table II.). This treatment caused the colour of light plums, such as Victorias, to become dull and darker, but no other change was obvious. The chloroformed fruit was far less liable to suffer damage by subsequent handling than when the fruit had been steamed, and the effect produced by this preliminary treatment was found to be far more uniform throughout the mass of plums than when steaming was adopted.

TABLE II.—*The Influence of Chloroform on the Subsequent Drying of Plums.*

Material.	Condition of Drying.	Weight after Drying.	
		Chloroformed.	Control.
Victoria, 10 lb.—		lb. oz.	lb. oz.
Very unripe	12 h. at 70°–80° C.	1 6	3 8
	18 h. ,,	—	1 14
Unripe	12 h. ,,	2 0	3 4
	18 h. ,,	—	1 12
Mod. ripe	6 h. ,,	4 12	6 4
	12 h. ,,	2 3	2 14
	18 h. ,,	1 2	1 11
Ripe	12 h. ,,	1 14	1 12½
	18 h. ,,	1 0	1 8
Very ripe	8 h. ,,	3 6	3 6
	12 h. ,,	1 8½	1 6½
Pond's Seedling—			
Ripe, 10 lb.	18 h. ,,	1 8	1 7

From these results it is seen that chloroform shortens the drying process by approximately 6 hours in the case of the less ripe fruit ; also, that the rapidity of the drying process is largely dependent upon the degree of ripeness of the fruit to be dried. It is clear also that the influence exercised by the

chloroform practically ceases when the fruit dealt with is completely ripe.* Even with unripe fruit, in which case chloroform produces its maximum effect, the more rapid rate of drying brought about by this preliminary treatment is not maintained throughout the entire drying operation. A steady falling off is noticed, so that after about 18 hours the degree of dryness of the treated and non-treated fruit is approximately the same. The degree of dryness obtained at this point, however, is greater than that required for the preservation of the fruit, so that the benefit of this treatment is by no means lost. The main advantage is derived from the fact that a mixed sample of plums, comprising fruit at various stages of ripeness such as is usually sent to market, when submitted to the vapour of chloroform for 30 minutes, dries afterwards as though all the plums were in the same condition, namely, fully ripe. This means that at the conclusion of the drying period a far more uniform product is obtained and the necessity is removed for picking out from the bulk a considerable number of plums which have dried at a much slower rate owing to their having been in a less ripe condition to begin with. The development of this method is held to be of considerable importance as affecting the possibility of drying plums commercially.

In order to make the work relating to the preliminary treatment of the plums as complete as possible, trials were made of a modification of the method employed in the preparation of the Agen plums—a method which practically amounts to slowly stewing the plums in their own vapour. For this purpose the plums were heated in a closed chamber at a temperature of 45°–60° C. for about 6 hours. Then, after 12 hours' exposure to the air, they were again similarly heated between 60°–70° for about 6 hours and then evaporated in the usual manner.

Owing to the slow rate of drying and the low temperature at which it takes place it is claimed for this method that the skin of the fruit does not become cracked and certain chemical changes occur in the substance of the plum which do not take place at higher temperatures, so that the plum does not become soft again after the final drying process is completed.

The flesh of the plum was observed to be changed to a brownish colour by this process and the general appearance of the product resembled, somewhat closely, that of the familiar prune.

* As in the case of "dipping" and "steaming," the drying of ripe fruit appears to be retarded somewhat by previous subjection to chloroform.

The Drying Process.—Two types of machines were used during the investigation, namely a small "Gnom" machine and a vacuum plant which had been adapted to serve for experimental purposes in connection with vegetable drying. In the case of the "Gnom" machine, drying is brought about by means of a current of warm air which passes, by its natural draught, through tiers of trays containing the material to be dried. In the case of the vacuum plant, the material to be dried is maintained at a uniform temperature in a heated chamber which is evacuated down to a pressure of about 5 to 10 in. of mercury.

Although it cannot be said that these machines represent the best kind of hot air or vacuum drying appliance, each machine was generally suitable from the point of view of the enquiry. In the case of the "Gnom" machine the material can be easily manipulated and kept under observation without interrupting the drying process; whereas, in the case of the vacuum plant, this is not possible without breaking the vacuum and opening the apparatus which causes loss of heat and much delay. There is a considerable waste of heated air from the top of the "Gnom" machine and the flue chimney being outside the apparatus, no use is made of the heat of the flue gases; so that the coal consumed by this machine is unduly high. Perhaps a more serious drawback is the deposition of moisture from the humid hot air as it travels upwards and cools. In consequence of this, the drying of the fruit situated in the upper trays is retarded very considerably, and unless very carefully controlled the partially dried fruit on these trays may actually take up moisture again and become wet. With this machine considerable experience is necessary to keep the temperatures approximately constant, and it has been found that the air currents are not uniform over the different parts of the drying area of the trays. All this means that careful manipulation and constant attention is necessary throughout the process of drying.

In the case of the vacuum machine efforts were made to maintain a uniform temperature in all parts of the drying chamber so that the fruit on all the trays should be dried approximately to the same extent during the same time, regardless of the position it might occupy in the machine. With the particular machine at our disposal this proved impossible to achieve, and it became necessary, therefore, to stop the drying process in order to sort over the fruit. As this could not be done economically at short intervals, it generally happened that a considerable number of the plums

were overdried or insufficiently dry at a time when the bulk of the material had reached the proper degree of desiccation. Once the doors are closed, the fruit receives no further attention until they are reopened and, as in practice the intervals between two successive openings would not be less than six hours, one experienced man would have an opportunity of attending to three or four similar machines.

Temperatures at which Drying was conducted.—Experiments carried out with the "Gnom" machine showed that the highest temperature at which plums could be dried satisfactorily was between 80° and 90° C. When the temperature rose above 90° C. it was found that scorching was liable to take place so that drying was practically limited to a temperature below 85° C.

In view of the long periods during which no observations of the plums could be made when using the vacuum machine, the temperature was not allowed to rise above 80° C. Throughout the course of these trials the temperature was always maintained between 70° and 80° C.

Drying Period.—When operating with the "Gnom" machine and when the plums had not been subjected to any preliminary treatment, the time necessary to attain to a proper degree of dryness was about 25 hours,* whereas, in the case of the vacuum machine, the same degree of dryness was reached after about 18 hours.

Slight differences in the time and temperature necessary to dry different varieties of plums have been recorded by previous workers and have been observed by us, but our experience shows that except where there is a marked difference in the size of the different kinds of plums dealt with, variations in their stages of ripeness is the main factor causing differences in the number of hours necessary for their proper drying. Thus, for example, unripe Victorias compared with ripe Victorias took 8 hours longer to attain to the same degree of dryness, whereas only a difference of an hour or two was noticed in the case of different varieties of plums of the same size and apparently the same degree of ripeness. From results of this kind it seems clearly desirable to grade the fruit according to size and ripeness prior to drying, unless the preliminary

* It must be observed that this time—about 25 hours—is somewhat in excess of that recorded in the *Journal of the Royal Agricultural Society* when using the "Invicta" type of machine. This does not necessarily indicate any actual difference, because in our trials the plums used were such as are sent commercially to market and may have been less ripe than those used in the trials referred to.

treatment with chloroform is to be carried out, in which case it is only necessary to grade according to size.

It seems clear from our trials that ripe Victoria plums containing 84 per cent. of moisture must be dried down to approximately one-fifth of their original weight in order to be in a fit state for temporary storage or for subsequent treatment. Although not completely dried at this stage—containing approximately 20 per cent. of moisture*—they appear to keep indefinitely if properly exposed to the air before being stored. If, however, they are put away loosely packed in closed receptacles they soon " sweat " and it is not long before mould develops on such plums.

Intermittent drying was generally adopted in these experiments although several unbroken trials were carried out for the purpose of making a comparison. No advantage was derived from continuing the drying uninterruptedly for 18 hours, so, for reasons of convenience, the drying periods were seldom continued for more than 12 hours without a break. Generally, the drying was interrupted every six hours for the purpose of examining the fruit on the trays.

Nature of the Dried Product.—When no preliminary treatment was adopted and the plums were simply dried down to approximately one-fifth of their original weight in the manner described, the product, in the case of Victoria plums, was somewhat disappointing. The skin of these dried plums was tough and their general appearance was dull and unattractive; there was very little " flesh " on the plums and their taste was unpleasantly acid. When Victoria plums were dried for 12 hours only and then bottled, their colour became paler after keeping and considerable quantities of liquid exuded from them. They were quite unfit for storage purposes or domestic use. After drying for 18 hours, the colour of the product from the vacuum machine was darker and the general appearance better than the product obtained from the " Gnom " machine. In every case the plums dried for 18 hours were found to keep quite well when stored and, even when loosely packed in closed jars, they remained perfectly sound, the only change observed being the slow appearance of fruit sugar on the surface of the dried plums. No difference was observed in the

* In view of considerable variations in the size of the fruit-stone noticed with different samples of plums this degree of dryness is perhaps better defined with reference to the material without the stone—that is to say, the flesh of the fruit—rather than to the whole dried fruit. We have found with suitably dried samples that such (stoned) material contained approximately 24 per cent. of moisture.

appearance of material dried for 18 as compared to 22 hours, although the interesting fact was revealed that when dried for the longer period no crystallisation of sugar took place on the surface of the plums, even after having been stored for a considerable time (3 months).

When Victoria plums had been subjected to a semi-pruning or "stewing" process prior to drying, the colour of the skin of the plums coming from the "Gnom" machine was light and inferior to that of untreated plums; but, in the case of such material dried in the vacuum machine, the colour was better, being a dark reddish-brown. In both cases this preliminary treatment caused the flesh of the plums to become darker and, although still very acid, the texture and flavour of the dried product somewhat resembled those of the prune. In the case of Victoria plums which had been steamed previous to drying, it was found that in nearly every case the plums split during the early stages of the drying process, thus exposing the stone, and a good deal of the substance of the plum was lost. Dipping in alkaline solutions induced bad colour and texture in all varieties tried, and no lessening of the number of plums which split during drying was noticed. Very little advantage was found to result from pricking the plums prior to drying them. The dried plums were a little more glossy in appearance but this small advantage was counterbalanced by the sticky nature of their surface.

After Victoria plums had been submitted to the vapour of chloroform for 30 minutes and then dried for 12 hours the product obtained was dark in colour and of good appearance, being much better than when this treatment was omitted. With regard to quality and texture, it was comparable with the material obtained by drying untreated plums for 18 to 22 hours under similar conditions, the only difference being that after three months' confinement in closed jars, a greater proportion of sugar was deposited on the surface of the plums which had been previously chloroformed. These observations apply equally to other varieties of plums which were tried, namely, Yellow Magnum and Pond's Seedling, but in these cases, the appearance of sugar on the surface of the plums was not observed. In the case of Louvains, which are larger and darker than Victorias, a superior product was obtained. The dried plums were far more fleshy and still retained the original bloom of the fresh fruit. Dried Louvain plums were superior in size, taste and appearance to any other variety employed. A quantity of Louvain plums was dipped

into a strong syrup of cane sugar a short time before the drying was completed and then the evaporation was continued. This caused them to assume rather an attractive glossy appearance, but the sugar showed no sign of becoming crystallised and the dried fruit remained sticky, even after keeping for a considerable time.

The more fleshy black plums, Monarch, Black Diamond and Czar, all gave a better dried product than the Victoria. This was due to the character of the plum. Of those varieties the Monarch was the best from the point of view of external appearance. In this case also, the original bloom of the fruit was preserved to some extent and except for taste the product was equal to that obtained from the Louvain plum. With this variety, as with Black Diamond, sugar was not found to crystallise on the surface of the dried plums when stored, whereas, in the case of Czar plums, this external deposition of sugar was observed.

It cannot be said that the flavour of the dried plums we have prepared from the various varieties referred to is very agreeable. This is largely due to the inherent character of the plums dried, and also to the fact that they have been used before enough sugar has been stored in the fresh fruit to make the dried product sufficiently sweet for the ordinary palate. Although their texture is somewhat hard and their skin tough, all the dried plums prepared by the methods described have given excellent results when cooked.

Subsequent Treatment.—With the exception of the plums which were partially stewed preparatory to drying them, the dried plums obtained from all the varieties used were hard and leathery. It appeared that some kind of cooking process was necessary to convert them into a more attractive commodity. Having in mind the changes which were observed when these dried plums were stewed and from certain vague references found in the literature in connection with the preparation of French and California plums, trials were made to ascertain whether there was sufficient water left in the dried plums to effect their partial cooking when they were heated in closed vessels to 120° C. for a few hours. It was found, however, that the moisture present was insufficient to prevent the plums from becoming burnt, but the general effect of this treatment was in the direction desired. After only two hours heating in an autoclave to 120° C. the product, although somewhat burnt, was improved in colour and general appearance, while the texture of the finished plums was superior to the untreated

dried plums. Even in the case of Victoria plums their colour after this treatment resembled that of the popular prune.

Similar experiments at 105° C. carried out for a period of two hours led to similar results and the degree of scorching was reduced. When repeated with the addition of a small quantity of water to the plums and heated at a slightly lower temperature, namely 100° C. for three hours, the desired change was effected, although, in the case of the Victoria plums, a slight scorching had resulted which spoilt their flavour. Heating in an autoclave was then abandoned and the last mentioned experiment was repeated several times with Victoria plums packed tightly in closed vessels and heated in an atmosphere of steam at 97° C. for varying periods of time. It was then found that with Victoria plums, as with others, a good product was obtained after heating them for about four hours at 97° C. In these subsequent heating trials it was observed that caramelisation takes place even at this lower temperature unless a definite minimum amount of moisture is present. Unfortunately the impossibility of procuring further supplies of Victoria plums prevented this point from being worked out more fully.

In view of the lack of sweetness of the dried plums prepared and the toughness of their skins, attempts were made to employ a combined stewing and sweetening process by cooking the dried plums in a very highly concentrated solution of cane sugar, the point of view being that since the skin of the plum had been "killed" by the drying process, the sugar might be made to permeate the substance of the plum. The treatment employed seemed to have the desired effect as far as sweetening was concerned but it was found inpracticable to deal satisfactorily with the final sticky product.

The application of glycerine to the hard surface of the dried plums was not found to do more than improve their outward appearance and to render them more supple; the toughness of their skins was not appreciably reduced and the increased sweetness due to the glycerine applied was too slight to be of material advantage. Owing to the improved appearance after burnishing with very small quantities of glycerine it is likely that a finishing off process of this kind would prove to be of some commercial advantage.

Conclusions.—The best temperature at which to dry Victoria plums, as indeed all varieties of large plums, whether in a hot air or a vacuum machine, is from 70° to 80° C.

The time required for proper drying varies with the size and degree of ripeness of the fruit and differs according to the nature of any preliminary treatment to which the plums may have been submitted. Using moderately large plums, without any preliminary treatment, and working with the "Gnom" machine, the drying period was found to be approximately 25 hours as compared with 18 hours when dried by the vacuum process. With a hot air apparatus of better construction than the "Gnom," this difference in time of drying might be reduced.

Continuous evaporation for periods shorter than those indicated above fails to give a product sufficiently dry to admit of its temporary storage while fresh material is being dealt with.

With the exception of "dipping," all the methods of treatment prior to drying which have been followed, namely, steaming, pricking and exposure to chloroform vapour, tend to shorten the necessary drying period. The chloroform treatment has brought about the maximum reduction of time, *i.e.* 6 hours, or 33 per cent. in the case of Victoria plums.

Although the preliminary treatments mentioned exercise a marked influence on the time necessary for drying, the ultimate texture of the dried plum is but little improved so that a treatment subsequent to drying is necessary. The best results have been obtained by heating the dried plums in a limited quantity of steam in closed vessels for a few hours.

The exact conditions under which these changes are best carried out have not yet been definitely established and in this direction further work is necessary.

In conclusion we desire to acknowledge the very great assistance given by Miss Marriott during the early part of this work.

INVESTIGATIONS AND EXPERIMENTAL WORK CARRIED ON IN CHERRY ORCHARDS IN KENT DURING THE MONTHS OF APRIL AND MAY, 1915-1916.

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DURING the period in which cherries were in bloom visits were paid to orchards in the Faversham, Sittingbourne, Rainham and Selling districts of Kent.

The district in which the towns and villages just named are situated has long been famous for cherry growing, and, according to local report, this vale is the home of the cherry in England.

There are certainly at present in this district some of the finest cherry orchards in the country, while the remains of old orchards indicate that cherries have grown and luxuriated for several generations.

The soil along this valley shows some variation, but the bulk of it might be classed as a stiff clayey loam on a chalky clay, or in some instances on a more or less pure chalk. The health and vigour of the trees as compared with other parts of the county and other counties would appear to indicate that the soil already described constitutes a typical cherry soil.

Pollination Difficulties.—On systematically examining numbers of orchards the fact becomes apparent that the cherry grower has, perhaps, as many pollination difficulties to face as the apple, plum and pear grower.

The modern cherry grower has been trying for years to reduce the number of varieties, and has in many cases departed from the old system of a general mixture and been more inclined to plant in blocks. This system has to some extent accentuated the pollination difficulties.

Although in this cherry district there still remain many old local varieties, the general tendency has been to eliminate the old and introduce the more modern. This being the case, the varieties now grown are pretty well defined and similar all over the area which may be termed the Faversham district. The varieties giving the most trouble are Early Rivers, Turk, Elton, Amber Bigarreau (syn. Kentish Bigarreau), and Waterloo.

It was decided in the first place to watch these five varieties and make careful notes on the sites where any of them might be found to crop well; also to note any varieties intermixed with them and in proximity to them, and to observe their respective flowering periods.

As a guide in this direction several lists were already in hand from large growers, giving the flowering periods in their particular districts.

A considerable amount of information has been obtained, and if this could be backed up by careful and more extensive investigation in the future, data of practical utility to the cherry grower would in all probability be obtained.

All the varieties noted as giving trouble are most desirable from a commercial point of view: they keep up a succession, and when well grown they meet a ready sale. Unfortunately, one of the varieties (Elton) would appear to be of weak constitution, or, rather, is losing its former robustness, and shows a tendency to die back and canker in many districts.

Blooming Periods.—Among the five varieties already named, Early Rivers, Turk and Elton are the earliest bloomers, and this is also true with regard to their relation to all the principal commercial varieties which are grown in the county.

There are one or two other varieties which flower very early, *i.e.* Adam's Crown, Knight's Black, Caroon's, Victoria Black, etc. It would appear that some of these latter varieties are factors in the setting of Early Rivers on some plantations. From an average of the records of the blooming periods of cherries which have been obtained from various growers over several seasons, it would appear that the blooming period of cherries may be put down at from 21 to 25 days. This is only approximate, as the seasonal variations are great. In a dry, hot season the periods will be shorter, and in cold, wet sunless seasons longer. The period over which the trees may be said to be in full bloom is very much shorter, 10 to 12 days being about the limit.

Some varieties come into bloom very gradually, others more suddenly, and the same may be said of the period during which the petals fall: some have a succession of late bloom, others are over at once. Varieties which keep opening a late crop of bloom, after the bulk of the main bloom has been shed, often set a partial and sometimes a good crop in unfavourable seasons, after the main crop of bloom has been destroyed by frost.

Frost.—During the observations, indications were incidentally found which seemed to point to the fact that certain varieties have more delicate blossom than others, and are, therefore, more liable to damage by frost. During the blossoming period of 1915 there were two or three nights when the thermometer registered three and four degrees of frost.

The effects of this frost were clearly observed on Elton and Turk. A large number of orchards was visited during the blossoming season and in every instance, where the blooms of these two varieties had been open early, they were considerably damaged by frost. This was corroborated again in 1916, when the same and other orchards were visited.

Elton seemed to have suffered most severely. Large numbers of the bloom trusses on the upper side of the twigs were quite brown, despite the fact that blossoms of this variety are pendulous and supported by a long and very slender strig (strig is the term used amongst growers for fruit stalk).

In all the low-lying orchards it appeared that quite half the bloom of this variety had been destroyed, the stigmas as well as the petals being affected, although the anthers did not seem to have suffered in the same way, and apparently were dehiscing normally. In the case of the Turks, the same conditions were observable to a lesser extent. The blossoms of this variety have a short stout strig, which does not protrude them beyond the foliage, and they have, therefore, probably more protection.

In the case of Early Rivers, the blossoms are strong and large, and the petals thick in texture. Indications of damage from frost were almost entirely absent, although the opened blooms had passed through the same climatic conditions as Elton and Turk.

This evidence, combined with other of a similar nature from other parts of the country, has led the writer to assume that the poor returns often obtained from Elton and Turk may be due in a great measure to their susceptibility to damage from frost. On the higher orchards Elton and Turk seemed to be cropping better and had suffered less from frost. This was probably not due to the fact that the frost was more severe in the valleys, but to the fact that the blooming periods in the higher orchards were later.

Soils.—It was also observed that on heavy loams overlying clay, all varieties were several days later in coming into bloom than the same varieties on lighter loams with more chalky sub-soils.

This was particularly noticeable on the plantations of Mr. W. W. Berry, where cherries are well grown. At Gushmere Court, Selling, Early Rivers was more than a week ahead of the same variety at Newton, and the distance apart is only a matter of a few miles. The Newton plantations are considerably higher, and that will also have an effect. The difference in some cases, however, was to be seen on the same plantation where the soil varied.

On the heavy soils all varieties come into bloom more uniformly, and the distinction in the times of blooming between early and late varieties is not so definitely marked. Climatic conditions have also something to do with this : for instance, in 1915 there was a tendency for all varieties to be in bloom together for a longer period than usual. The brilliant weather seemed to bring on the late varieties with a rush and there was thus more overlapping than usual. Last season, 1916, this was not so marked.

Pollination Problems.—Early Rivers is, generally speaking, the first variety marketable. It is a fine, large, dark-fleshed cherry of good appearance, and owing to its earliness and other good qualities, always commands a high price on the market, and if picked a little sharp it carries well. Many growers complain that over a long run of seasons they never have had a full crop, and oftener only a quarter crop.

At Gushmere Court, Selling, several trees of this variety have a reputation of cropping well and constantly.

At this centre it was brought to notice that there is another variety, known in Kent as Baumann's May, which is very similar to Early Rivers. So great is the similarity that this variety is sent to market along with Early Rivers, and is never detected. It commands the same price, and its time of ripening is identical with Early Rivers. This variety (Baumann's May) is planted along with the Early Rivers trees at Gushmere Court. The question as to the possibility of its being a polliniser for Early Rivers at once arose.

Cross between Baumann's May and Early Rivers.—With a view to determining whether the pollen of Baumann's May would set Early Rivers, it was desired to carry out some experiments on the spot. Mr. W. W. Berry at once concurred, and kindly afforded every possible facility. In this work the writer was very ably assisted by a sub-inspector, Mr. Cousins, who went round and examined the crosses and took careful notes of the results obtained.

The writer accordingly set about making crosses between Baumann's May and Early Rivers. Two trusses of Early Rivers were selected on separate trees. All open blossoms were cut away. The unopened blossoms which were on the point of opening were gently assisted to do so. Three of the strongest blossoms were then selected, and the anthers which had not dehisced were carefully removed. All the other unopened blossoms were now cut away and pollen was conveyed from blossoms of Baumann's May by means of a camel's hair brush and placed on the stigmas of the blossoms of Early Rivers, which had been prepared for its reception. The truss was then carefully surrounded with a muslin bag and labelled. A note was now made as to the cross, its position on the tree, and the position of the tree in the plantation. The brushes used for conveying the pollen were carefully sterilised in absolute spirit after each operation.

From these crosses it was found that the pollen of Baumann's May did set Early Rivers. Every blossom of the latter variety to which pollen was brought, set and matured fruit.*

At Mr. Thomas' orchard, Buckland, near Sittingbourne, Early Rivers and Baumann's May are again in mixture, and here both varieties always crop well and have done so for a number of years.

At another orchard in the district, this combination does not seem to be so satisfactory, but in this case the trees are young, making strong growth, and not bearing an abundance of blossom. Probably they will come into fruiting all right as soon as the growth is steadied.

There are other centres where Baumann's May exists, and these should be carefully watched.

On close examination Baumann's May presents characteristics by which, when in leaf, a careful observer can readily distinguish it from Early Rivers. The habit of Baumann's May is slightly more spreading and the young growths and leaves are more pendulous than Early Rivers. The whole habit of the tree indicates that it is a rather stronger-growing variety than Early Rivers. In other respects the two varieties are very similar and the fruits when ripe are identical, but in the earlier stages of ripening a mottling appears which seems to indicate traces of the Bigarreau blood.

Baumann's May as now known in Kent does not coincide with the description given in Hogg's Manual (5th Edition) and can hardly be the same variety.

* This cross has also been made at other centres, in every case successfully.

It seems, however, to resemble the variety described in the "Cherries of New York" (Hedrick) under this name, and it is there suggested as a good polliniser for early cherries.

Cross between Goodenston Black and Early Rivers.—The next crosses were made at South Street Plantations near Selling. Early Rivers does not fruit so well here, although the trees are healthy and receiving the best cultural treatment.

There are no trees of Baumann's May in this orchard, and the soil and situation are very similar to the Gushmere Court plantations. An early local variety of considerable merit is grown in this plantation under the name of Goodenston Black, and is some distance from Early Rivers.

Crosses were made here by conveying the pollen of Goodenston Black to some trusses of Early Rivers. The operations were performed on the same lines as already described. It was afterwards found that all the blooms pollinated with the pollen of Goodenston Black set fruit.

Other Pollinisers.—At Newton plantations on a heavier soil and at a higher elevation, the Early Rivers were overlapped by every variety, that is to say, every variety of cherry in the plantation was in full bloom several days before Early Rivers were over (out of bloom).

Crosses were made with Amber Bigarreau and Early Rivers and the blossoms pollinated all set fruit. This cross, however, is of little value, as in most instances Amber Bigarreau would be rather late for the first crop of bloom on Early Rivers on many early plantations.

Observations in other orchards where Early Rivers trees were fruiting well, and had done so in the past, seemed to point to the advantage of Turk, Elton and Knight's Black as pollinisers for Early Rivers.

In the majority of cases Turk was the variety in admixture.

At Bath's Limited, Wisbech, some Early Rivers crop well every season, and in this instance Knight's Black appears to be the polliniser.

Certain Varieties as Pollinisers.—*Elton or Elton Heart* is a very desirable white cherry, with pale rosy blotches and sometimes a crimson flush on the exposed side; the flesh is firm, sweet, and juicy, and when well-grown the fruit is large. The tree has a slightly weeping habit, and the foliage is pale-green in colour with long stipules.

On some plantations it grows well, but owing to the fact that many growers find it rather an uncertain cropper, with a tendency to die back and canker, fewer young trees of this

variety have recently been planted ; indeed, the writer has not come across a young plantation with this variety included. As soon as a variety becomes unpopular, large growers cease propagating it, while young planters who seek advice are dissuaded from planting. In this way the variety gradually disappears from a district ; there are several varieties in this category at present. Many of the old varieties, once common, seem to have gone in the same way.

At Bloer's Farm, Rainham (Mr. Stewart), crosses were made on Elton, which was the most unsatisfactory variety in a large plantation. The pollinator was Early Rivers. This variety was at some distance from the Eltons, and if the crosses had been satisfactory, inter-planting with Rivers would have been suggested. The muslin bags, however, were apparently too much of an attraction for the natives, and they were taken off and otherwise interfered with, to such an extent as to render any scientific conclusions very unsafe.

At the plantations of Mr. Knowles, Nailbourne, near Faversham, Elton is again the variety which crops lightly. In this orchard, which is a very old one, there are no Early Rivers, this variety being of too recent introduction. At the time of the visit, the only variety in bloom in the vicinity was Governor Wood. Pollen was conveyed from this variety to Elton, and the pollinated blossoms all set.

At the time of the cross it was apparent that Elton was three parts over while Governor Wood was only coming to its best, and it would, therefore, not seem a safe recommendation to suggest Governor Wood as a mate for Elton. Some other crosses were made, but are not worthy of note as there was a great disparity between the blooming periods of the varieties.

Another season it would be well to see whether Elton will set freely with its own pollen. If it should prove to be self-fertile the writer would conclude that its liability to frost is, to some extent, the cause of its failure. Early Rivers and Turk should also be selfed.

Turk or Black Tartarian is a variety which is very extensively grown. Although it is an early bloomer it ripens its fruit comparatively late. The fruit when quite ripe, is coal-black and very handsome. The foliage is deep green and very broad, the leaves being larger than those of any other cherry. The tree is a very erect grower. The fruit has a rather shorter and thicker strig than Elton.

Experiments with this variety should be made to ascertain whether it is self-fertile. Up to the present it has been

assumed that it is not, but the assumption is only based on the fact that it does not set well in some seasons. As already mentioned, there are indications that it is liable to frost and this may account for its failures.

There would appear to be a mutual affinity between this variety and Early Rivers, and it is probably a good polliniser for several other varieties.

Amber or Kentish Bigarreau is the most extensively cultivated variety of cherry in Kent. Mr. Bunyard describes it as "the most profitable cherry grown and the glory of the Kent orchards."

The fruit is shaded and blotched red and orange and the flesh is deep primrose in colour, crisp, juicy, and of rich flavour.

This cherry usually bears heavily if mixed with or surrounded by other varieties.

All varieties in bloom with it seem to pollinate it. Frogmore Biggareau and Governor Wood and Waterloo seem to suit it. When, however, this variety (Amber Bigarreau) is completely isolated, it soon shows its sterility.

There are several cases in evidence in which, owing to a desire on the part of the grower to increase this variety out of proportion to all others, it has been planted in isolated blocks. In every case where this isolation has taken place the results have been very disappointing. There are two notable cases, one at Rainham and the other at Sevenoaks; in the latter case 18 acres of this variety had, up to a few years ago, never borne, and the eventual bearing was brought about by the introduction of Frogmore Bigarreau.

Waterloo Black is one of the best mid-season, dark-fleshed cherries. The flesh is sweet and very rich, and the fruit is well protected by the foliage so that it is not so liable to crack (split) in showery weather. This is a most valuable point to the grower, and if the consumer only knew the variety and could get it when in season he would eat no other cherry. It is widely distributed over Kent, but not so well known outside the county. It resents at once an isolated position. Some growers have increased it out of proportion to their other varieties and have suffered severely from want of crops, over long periods.

The largest plantation of Waterloo Black cropping well which was visited was at Gosmere near Faversham (Mr. R. B. Amos). The plantations of this grower are on high ground, and the only effect noted was that all varieties were several days later than down in the Faversham valley. The trees were very healthy

and cropping very heavily. The Waterloos were interplanted with Amber Bigarreau in equal proportions in alternate rows. This certainly seemed to be an ideal combination for pollination purposes.

The plantations of Mr. Dean, near Sittingbourne, were next visited. Here there are several acres of Waterloos which have never borne a full crop. The trees were very clean and healthy and were producing an abundance of bloom. It was stated that they have bloomed profusely for a number of years. Crosses were made in this block by bringing pollen of Amber Bigarreau and fertilising and bagging several trusses of Waterloo. The operations were entirely successful and every fertilised blossom set fruit. The crossing here was very striking, as all over the trees only an odd fruit had set while all the trusses fertilised were a picture.

At the opposite corner of the Waterloo plantation from where the crosses were made there are a few Amber Bigarreaus, and their influence on the Waterloos was most marked. The outer row of Waterloos next the Ambers was carrying a heavy crop, and for one or two rows inwards the crop was good. It then gradually fell off as the distance from the Amber was increased. The crosses here were most impressive and were fully appreciated by the manager. In 1916, the same conditions occurred on this plantation, the two rows nearest the Ambers cropping heavily while the rest of the plantation cropped very lightly. The nearest row of the Ambers was distinctly the best.

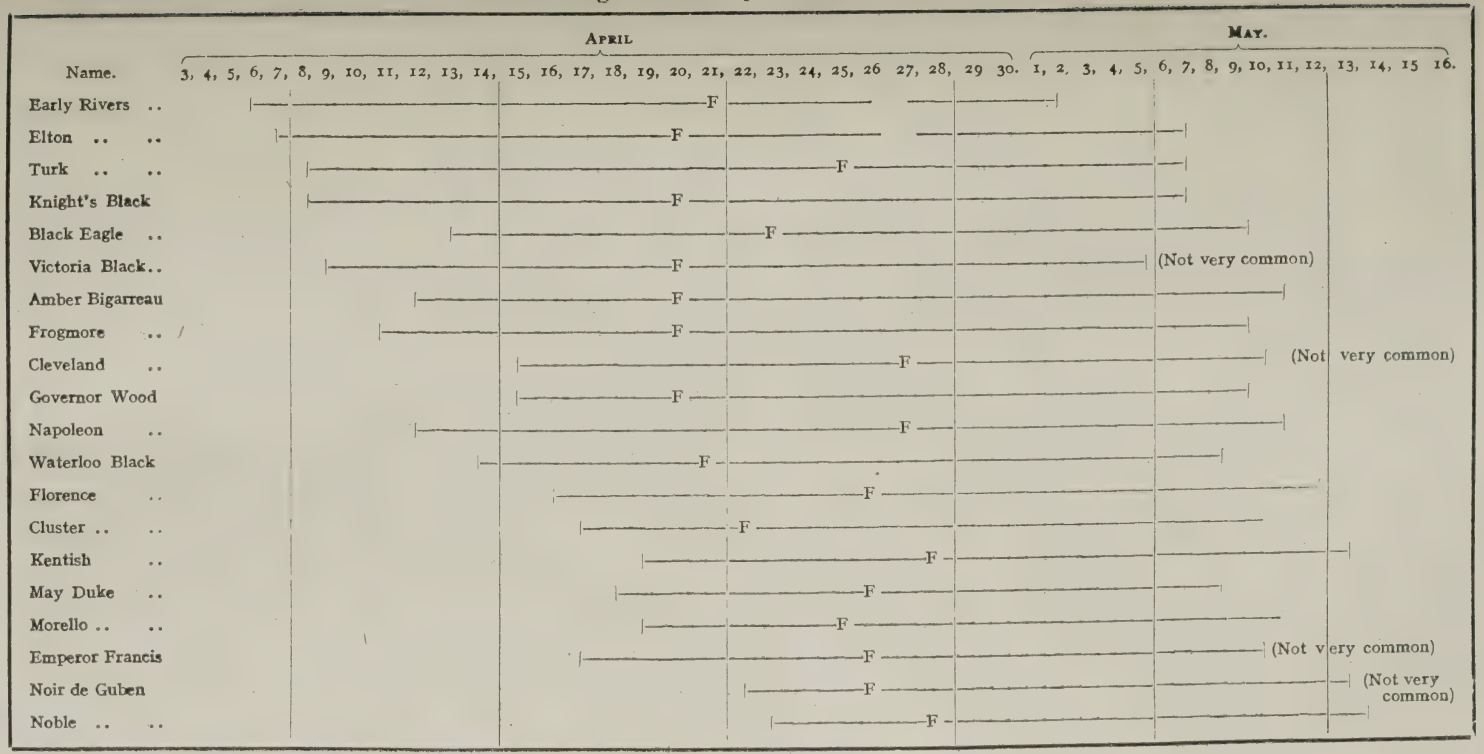
At the orchard of Mr. Thomas, in the same district, Waterloos crop very badly. They are young, healthy trees, producing an abundance of bloom, but apparently owing to the absence of a suitable mate they never set their fruit. There are no Amber Bigarreaus near them, and the nearest varieties appear to have no effect as pollinators. A variety is grown here known as Cleveland Bigarreau, which appears to be at home and crops heavily.

Observations at other centres seem to confirm the assumption that there is a mutual affinity between Amber and Waterloo.

Old Varieties.—Some of the old varieties might be worth working on modern stocks. *Reynold's Heart* and *Bloer's Black* are two very fine old varieties which are fast dying out.

In some other counties there are also valuable old varieties. In the county of Buckingham many of these occur. The general system of planting in this county seems to have been

Blossoming Periods of Cherries in Kent.



F = Full Bloom.

This Table represents the Faversham district of Kent, and would be subject to variation in different districts, on different soils, and in different seasons.

never to plant two trees of the same variety in proximity. The orchards are very mixed and the picking laborious, but there are no pollination difficulties.

General.—The culture in Kent amongst the best growers is in advance of any cherry culture in other counties. Like every other fruit the cherry responds to good cultivation. There is a remarkable difference between the size and quality of the fruit from an orchard that is being manured and heavily stocked and that from an orchard which is being starved.

It would appear that there is great scope as well as need for investigation amongst British cherries.

The season of blooming, however, is short; indeed, the whole cherry season from first bloom to the end of fruit picking is only, at the most, 4 to 5 months. This being the case it is impossible to cover a large area during the season when work in the way of crossing could be done.

Probably only a few of the problems have been touched upon in this report. Many other varieties are extensively grown and difficulties exist amongst them also.

It would appear that only by observations in the open will be secured definite information which will be applicable under natural conditions.

The diagram on p. 297 shows the flowering period of the principal varieties of cherry met with in the Faversham district. The periods represent an average of observations over four years. It seems to prove that all varieties are in bloom together for a certain period. No variety is out of bloom before any other variety comes in; they all overlap. It will be seen in a general way from the table of blooming periods: (1) that early varieties come into full bloom very gradually; (2) that mid-season varieties come to full bloom more rapidly; and (3) that late varieties come very rapidly to full bloom and go off more slowly.

In 1916, owing to pressure of work due to the War, it was not possible to carry out the desired selfing tests. The orchards were, however, all visited during the fruiting period, and the suggestions which presented themselves in 1915 seemed again to be corroborated, but the foregoing notes can only be looked upon as an introduction to the subject. If, however, they are the means of inducing any growers under whose observation they may fall to be more observant, a good purpose will be served. All communications on the subject will be of great interest to the writer, especially if they deal with sterile blocks or suitable combinations.

BURIED WEED SEEDS.

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ONE of the most widespread beliefs among English farmers is that whenever land that has not been disturbed for long periods is ploughed or dug up a large crop of arable weeds, usually charlock or poppy, will be forthcoming the following year. If a deep well be dug, charlock is said to spring up on the dumped material; if an old pasture, that has been under grass for time immemorial, be broken up, still the armies of charlock or poppies are said to appear. The quantities of plants reported are far too large to admit the supposition that the seeds could have been transported by birds or wind after the ploughing, and it is popularly assumed that they have been buried in the soil for many years, awaiting a favourable opportunity to germinate.

In the course of several years' research on the weeds of cultivation, this matter has been reported again and again. Careful inquiry showed that many of the instances did not rest on sufficient evidence to justify their acceptance. In other instances there was obviously much truth in the statement, but still closer investigation showed that most of the authentic cases were on land which had at some time or other been under arable cultivation, and were not on real old pasture.

During the last 18 months, experiments have been carried out at Rothamsted to ascertain what seeds capable of germination are present at different depths in soils under differing cultural conditions. Arable fields, old pasture, and pastures of varying ages have been laid under contribution. A sampling iron, 6 in. by 6 in. by 9 in., was driven into the ground flush with the surface. The soil was then carefully removed inch by inch and placed in paper bags labelled with the depth, the tool being driven in further in order to get the soil to a depth of 12 in. The samples were transferred individually to clean, sterilized pans or boxes in a glass-house. The soil from the lower depths was chiefly clay, and this was broken up into small pieces with the fingers; after some months a certain amount of disintegration of this sticky clay took place. The soil was kept moist and left alone. Before long, seedlings began to put in an appearance, and as soon as each was big enough to identify, it was noted and removed from the soil. Occasionally, when the earth became badly caked, it was cut up and stirred about with a knife, care being taken

that no crumbs of soil were transferred from one pan to another. In most cases three or four holes were sampled in each field, but in the tables below the results for each depth from all the holes are added together.

A—**Old Pasture.**—Samples were taken from two pieces of land that have never been arable as far as is known, but have always been under grass. On Harpenden Common the soil is fairly light in texture, in Rothamsted Park it is heavier and carries good grazing pasture.

(1) *Harpenden Common.*—This has probably never been cultivated. Very few weed seeds germinated at all, not a single arable weed appearing. A very large number of grass and woodrush seeds were present in the first inch or two of soil, and a few grasses were scattered at lower depths; otherwise 4 yellow bedstraw (*Galium verum*), 2 yarrow (*Achillea millefolium*) and 1 vetch (*Vicia* sp.) represented the whole crop of the nine months' experiment.

(2) *Rothamsted Park.*—This land has been under grass for at least 300 years. Numerous seeds germinated down to a depth of 10 in., 240 seedlings of grassland plants other than grasses and clovers putting in an appearance in the 1 sq.-ft. area covered by the four holes. Three arable seedlings came up in addition, one charlock, one orache (*Atriplex patula*), and one either orache or fat hen. The seeds of charlock and fat hen are very heavy and offer no facilities for wind transport. Orache seed remains enclosed in its envelope, but the weight of the seed renders it improbable that the wind is an effective agent in the distribution of the plant. The nearest arable field to the sampled area is nearly half-a-mile away, and a wood intervenes, so that it is most unlikely that even the orache was carried to the park by wind. Possibly the seeds had at some time been carried on to the land sticking to the feet of horses and had worked their way down. They may even have been introduced by sheep, as up till 1874 it was the custom to graze off the aftermath in this part of the park.

These two instances illustrate the fact that arable weed seeds are absent from old pasture land, except for an occasional seed that must have come in from outside by accidental means.

B—**Pasture. Originally Arable.**—Several fields were investigated which were originally tilled but which have been under grass for a varying number of years. In one case (New Zealand Field) the samples were taken on the grassland just before it was ploughed up in 1915 and field notes were made in 1916, so that a comparison is possible between the glasshouse and field results.

(1) *Geescroft Field.*—Geescroft was used for various expert ments up to 1878, but, as the land was very wet and unfavourable for working, it was left fallow for several years and was finally joined up with the park in 1885, so that the area has been under grass for 32 years. Geescroft is very remote from the nearest arable land, so that the possibility that the weed seeds had been carried by wind is very small.

TABLE I.—*Geescroft Field. Holes* 1, 2, 3, 4.

	Depth in inches.												Totals for each Hole.	Grand Total.
	1	2	3	4	5	6	7	8	9	10	11	12		
Scarlet Pimpernel (*Anagallis arvensis*)	–	–	–	–	2	–	2	–	–	–	–	–	0+ 1+ 1+ 2	4
Orache (*Atriplex patula*) ..	–	–	–	–	–	–	1	–	1	–	1	–	1+ 0+ 2+ 0	3
Forget-me-not (*Myosotis arvensis*)	–	1	–	–	–	–	–	–	–	–	–	–	1+ 0+ 0+ 0	1
Poppy (*Papaver* sp.) ..	–	–	–	–	1	–	–	–	–	–	1	1	0+ 0+ 0+ 3	3
Knotgrass (*Polygonum aviculare*)	–	2	3	4	3	13	9	6	6	2	3	1	9+18+ 6+19	52
Black Bindweed (*Polygonum Convolvulus*) ..	–	–	–	1	–	–	–	–	–	–	–	–	0+ 1+ 0+ 0	1
Field Speedwell (*Veronica agrestis*)	1	–	–	–	–	–	–	–	–	–	–	–	0+ 1+ 0+ 0	1
Umbelliferæ spp.	–	–	–	–	2	1	–	2	2	–	–	–	0+ 2+ 0+ 5	7
Totals	1	3	3	5	8	14	12	8	9	2	5	2	11+23+ 9+29	72

Table I. shows that a large number of typical arable weed seeds were present in the soil, knotgrass (*Polygonum aviculare*) being specially abundant. The numbers are so high that all possibility of accidental infection is excluded, and it may be taken that practically, if not entirely, all the seeds were present in the soil when it was grassed over in 1885, and that they have lain dormant ever since awaiting an opportunity to germinate. If knotgrass seeds were in the same proportion over the whole area, more than two million would be present per acre. Such a calculation is merely of relative value, but it serves as a proof that the presence of the knotgrass is not merely accidental, but that a very large number of seeds must have retained their germinating capacity during the 30 years they have been buried in the soil. Besides the arable seeds there appeared 43 seedlings of plants that occur both on arable and grassland, and 352 seedlings of plants characteristically associated with grassland and not seen on arable soils. It is very noticeable that the greatest number of grassland seeds occur in the top 4 in. of soil, whereas most of the arable seeds are 5 to 9 in. below the surface, indicating that the arable seeds that were initially present in the surface soil either germinated or died, while those lower down in the soil

have been under conditions which hindered germination but preserved the capacity for growth.

The old Rothamsted records show that all the weeds which appeared from buried seeds in 1916 were present among the arable crops in 1867, furnishing additional proof that the seedlings are really derived from seeds buried in the ground when the area was grassed over. None of these weeds now appear among the surface vegetation of Geescroft, with the exception of *Myosotis arvensis*, which is able to hold its own on grassland.

(2) *Barnfield (grass)*.—This area was under arable cultivation until about 1874 and w s then laid down to grass.

Far fewer arable weeds are evident here than in Geescroft, but there are also fewer grassland weeds. Field observations showed that comparatively few species, other than clovers and grasses, occur in the surface vegetation of the field, thus accounting for the paucity of species in the underlying soil.

TABLE II.—*Barnfield Grass. Holes* 1, 2, 3, 4.

	Depth in inches.												Totals for each Hole.	Grand Total.
	1	2	3	4	5	6	7	8	9	10	11	12		
Orache (*Atriplex patula*) ..	–	–	–	–	–	–	3	–	4	–	–	–	0+ 0+ 5+ 2	7
Charlock	–	–	–	–	–	2	–	–	–	–	1	–	0+ 0+ 3+ 0	3
Small Toadflax (*Linaria minor*)	–	–	–	–	–	1	–	–	–	–	–	–	1+ 0+ 0+ 0	1
Forget-me-not (*Myosotis arvensis*)	–	–	–	1	–	–	–	–	–	–	–	–	0+ 1+ 0+ 0	1
Poppy (*Papaver* sp.) ..	–	1	–	–	–	–	–	–	–	–	–	–	0+ 1+ 0+ 0	1
	–	1	–	1	–	3	3	–	4	–	1	–	1+ 2+ 8+ 2	13
Totals	–	2	–	2	–	6	6	–	8	–	2	–	2+ 4+16+ 4	26

(3) *New Zealand Field*.—This was under ordinary farm cultivation until about 1906 ; it was then seeded down and worked as a pasture until 1915, in the autumn of which year it was ploughed up. The samples were taken before the ploughing, two sets of four holes being sampled in August and September. Tables III. and IV. show the large numbers of arable weeds which germinated up to December 6th, 1916.

After the ploughing, great crops of arable weeds came up in the field, charlock, poppy, orache, dwarf spurge, large field speedwell, and chickweed being especially abundant. Every arable weed represented in the " buried seeds " pans appeared in the field weed crop, with the single exception of *Arenaria serpyllifolia*, which was probably overlooked on the field or confused with small *Stellaria media*. It was rather surprising that comparatively little knotgrass was evident on the field, as such large numbers appeared in the greenhouse.

TABLE III.—*New Zealand Field. Holes* IN, 2N, IS, 2S.

—	Depth in inches.												Totals for each Hole.	Grand Total.
	1	2	3	4	5	6	7	8	9	10	11	12		
Orache (*Atriplex patula*) ..	–	2	7	5	6	7	3	8	9	24	8	26	24+ 6+40+35	105
Thyme-leaved Sandwort (*Arenaria serpyllifolia*) ..	–	–	–	–	1	–	–	–	–	–	–	–	1+ 0+ 0+ 0	1
Lady's Mantle (*Alchemilla arvensis*)	–	–	–	–	–	–	1	–	–	–	–	–	0+ 0+ 1+ 0	1
Charlock (*Brassica* sp.) ..	1	1	1	1	3	1	–	2	–	1	–	–	0+ 6+ 3+ 2	11
Shepherd's Purse (*Capsella Bursa-pastoris*)	–	–	–	1	1	–	–	–	–	–	–	–	0+ 0+ 0+ 2	2
Dwarf Spurge (*Euphorbia exigua*	2	3	2	2	3	1	1	–	–	–	–	–	7+ 2+ 5+ 0	14
Nipplewort (*Lapsana communis*)	–	–	–	–	–	1	–	–	–	–	–	–	0+ 0+ 1+ 0	1
Poppy (*Papaver* sp.) ..	6	9	5	13	15	11	4	2	–	–	–	–	6+36+15+ 8	65
Knotgrass (*Polygonum aviculare*)	4	7	7	5	5	7	5	1	4	19	1	–	32+ 1+17+15	65
Corn Sowthistle (*Sonchus asper*)	7	5	7	11	7	3	–	–	–	–	–	–	29+ 6+ 3+ 2	40
Field Speedwell (*Veronica agrestis*)	12	9	1	7	2	–	1	–	–	–	–	–	3+ 1+18+10	32
Ivy-leaved Speedwell (*Veronica hederæfolia*).. ..	3	2	3	5	3	1	1	–	–	–	–	–	2+ 4+ 5+ 7	18
Large Field Speedwell (*Veronica Tournefortii*) ..	26	7	14	7	1	1	–	–	–	–	–	–	23+ 5+15+13	56
Wild Pansy (*Viola tricolor*)	1	–	–	–	–	–	–	–	–	–	–	–	1+ 0+ 0+ 0	1
Totals	62	45	47	57	47	33	16	13	13	44	9	26	128+67+123+94	412

TABLE IV.—*New Zealand Field. Holes* IBN, IBS, 2BN, 2BS.

—	Depth in inches.												Totals for each Hole.	Grand Total.
	1	2	3	4	5	6	7	8	9	10	11	12		
Orache (*Atriplex patula*) ..	1	4	10	5	9	6	10	11	4	16	12	–	12+35+26+15	88
Charlock (*Brassica* sp.) ..	–	2	3	–	4	2	–	–	–	–	–	–	1+ 6+ 2+ 2	11
Dwarf Spurge (*Euphorbia exigua*)	2	4	5	4	3	4	1	1	–	–	–	–	7+ 1+ 8+ 8	24
Forget-me-not (*Myosotis arvensis*)	4	3	3	–	–	–	–	–	–	–	–	–	3+ 2+ 4+ 1	10
Poppy (*Papaver* sp.) ..	9	18	6	7	5	1	2	–	–	–	–	–	0+10+ 6+32	48
Knotgrass (*Polygonum aviculare*)...	8	4	10	7	9	8	1	4	3	–	1	–	5+13+31+ 6	55
Corn Sowthistle (*Sonchus asper*)	–	1	2	3	5	2	–	–	–	–	–	–	2+ 5+ 4+ 2	13
Field Speedwell (*Veronica arvensis*)	10	1	1	2	3	1	–	–	–	–	–	–	1+ 0+13+ 4	18
Large Field Speedwell (*Veronica Tournefortii*) ..	10	5	4	2	3	–	–	–	–	–	–	–	16+ 1+ 3+ 4	24
Ivy-leaved Speedwell (*Veronica hederæfolia*)	1	1	8	3	4	3	–	–	–	–	–	–	2+ 1+ 9+ 8	20
Wild Pansy (*Viola tricolor*)..	–	–	1	–	–	–	–	–	–	–	–	–	0+ 0+ 1+ 0	1
Totals	45	43	53	33	45	27	14	16	7	16	13	–	49+74+107+82	312

(Other weeds, common to arable and grassland, also appeared, including Chickweed (*Stellaria media*), Greater Plantain, Docks, Mouse-ear Chickweed and Common Sowthistle.)

It may possibly be that knotgrass is somewhat exacting with regard to the conditions for germination, and that these conditions were supplied in the greenhouse and not in the field. In most pot-culture work under glass, knotgrass is one of the most frequent weeds, showing that the seeds do grow well under such circumstances.

C—**Arable Land.**—Three arable fields were examined. One of these has been under ordinary farm management under rotation

cropping, and two have been used for specialised experimental work for many years under continuous and rotation cropping respectively. The method of treatment of the soil has had a radical influence on the weed flora, as the tables show.

(1) *Long Hoos Field.*—This field was under ordinary farm management.

TABLE V.—*Long Hoos. Arable. Holes* 1, 2.

	Depth in inches.												Totals for each Hole.	Grand Total.
	1	2	3	4	5	6	7	8	9	10	11	12		
Lady's Mantle (*Alchemilla arvensis*)	3	3	10	12	3	7	9	2	4	–	–	–	25 +28	53
Scarlet Pimpernel (*Anagallis arvensis*)	–	–	–	–	–	–	–	1	–	–	–	–	0 + 1	1
Thyme-leaved Sandwort (*Arenaria serpyllifolia*) ..	15	19	44	15	31	7	11	4	4	1	1	–	109 +43	152
Orache (*Atriplex patula*) ..	1	3	1	1	4	1	4	1	–	7	1	–	24 + 0	24
Orache or Fat Hen (*Chenopodium album*)	–	–	–	–	–	–	2	–	–	17	1	3	20 + 3	23
Charlock (*Brassica* sp.) ..	–	3	1	1	3	2	–	2	1		2	–	8 + 8	16
Dwarf Spurge (*Euphorbia exigua*)	1	1	–	–	–	4	–	1	2	–	–	–	5 + 4	9
Cleavers (*Galium Aparine or tricorne*)	–	–	–	–	–	–	–	–	–	–	–	1	1 + 0	1
Mayweed (*Matricaria inodora*)	8	12	24	8	9	10	4	1	–	–	1	5	39 +43	82
Forget-me-not (*Myosotis arvensis*)	2	–	3	–	–	–	1	–	–	–	–	–	0 + 6	6
Poppy (*Papaver* sp.) ..	–	1	2	–	–	–	–	1	–	–	–	–	4 + 0	4
Knotgrass (*Polygonum aviculare*)	–	1	5	2	1	7	2	2	1	1	–	–	8 +14	22
Black Bindweed (*Polygonum Convolvulus*)	–	–	–	–	–	–	–	1	1	–	–	–	1 + 1	2
Willow-weed (*Polygonum Persicaria*)	–	–	–	–	–	2	–	2	–	–	–	–	3 + 1	4
Corn Sowthistle (*Sonchus asper*)	–	–	–	1	–	–	–	–	–	–	–	–	0 + 1	1
Field Speedwell (*Veronica arvensis*)	3	4	1	1	3	5	–	–	–	–	–	–	10 + 7	17
Ivy-leaved Speedwell (*Veronica hederæfolia*)	–	1	1	–	–	–	–	–	–	–	–	–	2 + 0	2
Large Field Speedwell (*Veronica Tournefortii*) ..	–	5	22	26	19	–	7	–	–	–	–	–	70 + 9	79
Veronica sp.	3	–	3	–	–	9	2	4	3	–	–	–	11 +13	24
Umbelliferæ sp.	–	–	–	–	–	–	–	–	1	–	–	1	2 + 0	2
Totals	36	53	117	67	73	54	42	22	17	27	6	10	342+182	524

The figures show the position quite clearly. As was to be expected, the actual number of weed seeds which germinated is far above the number of those in the soils which had been grassed over. As only two holes were examined, covering an area of ½ sq. ft., some idea is given of the enormous number of weed seeds, capable of growing, that are present in the soil of an ordinary tillage field. Even now it is not probable that all the seeds have germinated, and with the coming of warmer weather the present total of 524 (representing over 45 million seedlings per acre) may be considerably increased.

(2) *Agdell Field.*—This plot has been under rotation experiments for 59 years since 1848, and has not received any

manure. Two samples were taken just after the field had been under a root crop. Cultivating between the roots tends to cut off the seedlings before they have time to flower and form fresh seeds, so that the soil was fairly exhausted of its weed seeds and only a few orache and fat hen seeds were left to germinate. The poverty of the soil, caused by the long period without manure, was a further contributing cause to the paucity of the weed species. A number of seedlings died without developing, but probably most of these belonged to the same two species.

TABLE VI.—*Agdell Field. Plot* 5. *Holes* 1, 2.

—	Depth in inches.												Totals for each Hole.	Grand Total.
	1	2	3	4	5	6	7	8	9	10	11	12		
Orache (*Atriplex patula*) ..	–	1	–	–	–	–	1	–	–	–	–	–	1 + 1	2
Fat Hen (*Chenopodium album*)	–	–	4	–	1	–	–	–	–	–	–	–	0 + 5	5
Orache or Fat Hen? ..	–	–	–	1	2	–	1	–	–	–	–	–	0 + 4	4
Totals	–	1	4	1	3	–	2	–	–	–	–	–	1 +10	11

(3) *Barn Field.*—This plot has carried root crops for 74 years in succession, since 1843, and has received no manure since 1853. The number of weed seeds is consequently very low, partly because the constant tillage has prevented seed production and partly because of the poverty of the soil due to continuous cropping without manure. Only six seedlings appeared, 3 dwarf spurge, 2 corn sowthistle, and 1 large field speedwell.

Transport of Arable Weed Seeds.—In dealing with the arable weeds that appear in broken-up pastures the question arises as to whether the seeds had been carried to the area by wind and then washed down by rain or taken into the soil by worms or moles. Wind transport, however, is not possible with most of the species met with during the experiments. The seeds of scarlet pimpernel, charlock, knotgrass, black bindweed, dwarf spurge, willow weed and several other species are too large or too heavy to float in the air, and they have no parachute or wing to aid in wind dispersal. Orache, in spite of its envelope, is too heavy to be carried a great distance. Only the very small and light seeds, such as poppy, sowthistle, and other composite species lend themselves to wind dispersal to any appreciable extent, but these were not present in sufficient numbers to alter the value of the results. Also, Harpenden Common, Rothamsted Park and Geescroft are so far from

the nearest arable land that it is unlikely that wind-borne seeds are able to reach the areas unless they are very specially adapted to this method of transport.

Conclusions.—From the above results the following practical conclusions may be drawn :—

(1) If very old pasture be ploughed up it is improbable that arable weeds will appear to any great extent the first year. Some few seeds, as those of groundsel, sowthistle, and dock, may be carried by the wind, and other arable weeds may be introduced in various ways, with the crop seeds, etc., so that, in the course of a very few years even broken-up old pasture can become colonised by a typical arable weed flora.

(2) If more recent pasture, 30 or 40 years old, be broken up, the case is different. The seeds of certain weed species are capable of lying dormant in the soil for long periods of years and of germinating when the land is broken up and conditions of growth become favourable. Most of the weed seeds in the top few inches of soil tend to germinate although the land is grassed over, and the seedlings are stifled by the grasses and clovers. Consequently, there are less germinable weed seeds in these top inches when the land is ploughed. Seeds in the lower depths, especially from 5 to 9 in., are unable to germinate owing to unfavourable conditions. These seeds retain their power of growth for a long time, but they gradually die off with the progress of years. The length of time such seeds can lie dormant varies with the species. There are, again, usually fewer seeds in the lowest 3 in. because under ordinary conditions of cultivation only about 9 in. of the soil is well worked ; any seeds in lower depths have had to work their way down through cracks and crannies and wormholes into the harder layers of the subsoil.

(3) Land under ordinary farm tillage contains great numbers of arable weed seeds capable of growing, especially in the top 7 in. of soil which is best cultivated. These seeds do not necessarily all germinate the year after they are shed, but a certain proportion lie dormant for varying periods and start into growth among later crops.

(4) The methods of cultivation and manuring have an important bearing upon the number of weed seeds that are present in the soil. Root crops are valuable aids in cleaning the land, as the constant hoeing not only cuts off young seedlings, so clearing the land for the standing crop, but also prevents the weeds from forming seed, so that later crops are likely to be freer from weeds.

EXPERIMENTS ON THE PREPARATION OF HOME-MADE RENNET.

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SINCE the publication in this *Journal** of the second paper dealing with the preparation of home-made rennet from fresh vells, further experiments have been carried out, the results of which are given below.

In the earlier experiments the largest numbers of vells used to 1 gal. of brine was 10, while in the present trials 15 vells have been added to the same quantity of brine, and one or two other alterations in the technique have been adopted. It may be well to describe briefly the method at present in use. The fresh vells are split open, the greater part of the contents shaken out, and any particles of clotted milk or of solid food which remain adhering to the mucous membrane are washed away in running water, but the vells are not allowed to remain in water for more than a few moments before being placed in the brine. Fifteen washed vells are then put into 1 gal. of brine which is made according to the method given in our first paper,† but recently it has been found necessary to filter the solution before use, as it contained dirt from the rock salt. The filtration is done through a coarse filter paper, but straining through a fine muslin would be quite effective. To the brine and vells, 2 oz. of boric acid are then added, the vessels are placed in a cool cellar, and the contents are stirred daily for a week or ten days, at the end of which time a milk-coagulation test is made. Coagulation tests are repeated at intervals, and at the same time the mucous membranes of the vells are examined to see whether they have become sufficiently soft to be readily scraped off. When this condition is reached, the extract is strained off through a cheese-cloth and the vells are removed from the bundle and placed on a grooved and slanting board, where the mucous membrane is carefully removed with a blunt scraper and returned to the original extract (first steep), while the scraped vells are placed in half the original quantity of fresh brine (second steep). The first steep is kept for a further period of time until it attains a suitable strength; it is then filtered through cotton-wool filters‡ and it may be mentioned here that if a small funnel is used inside the larger one, it is desirable that the stem of the inner funnel

* See September, 1916, p. 549. † See *Journal*, August, 1916, p. 460.
‡ See *Journal*, August, 1916, p. 461.

should be cut off at its base. After filtration the rennet should be bottled and stored in a cool, dark place.

The second steep is treated similarly to the first steep, except that the vells are not scraped. It is generally found necessary to leave them in the second brine for a longer period than in the first before a usable rennet is obtained, and as a rule, the second extract is considerably weaker than the first.

It has been found that extracts prepared in this way are frequently as strong as commercial rennet, and retain their coagulating properties for several months after preparation; in many cases they even improve considerably with storage. It is not possible at this stage of the work to state definitely how long the rennet will retain its strength, but an extract which was made nine months ago is stronger now than when first prepared, and none have been found to deteriorate in less than three months unless preservative was left out, or unless the vells used were in a bad condition. Further, it has been shown that during storage the bacterial flora of rennet extract undergoes considerable modification, and whereas freshly-made extract from vells taken from grass-fed calves contained numerous organisms, including those of the *B. Coli* group, as time went on a very marked decrease in the total number of organisms occurred, and at the end of about six months no organisms of the *B. Coli* group were found in 1 cc. of the extract.

During the months of March and April, 1917, the following amounts of milk were made into cheese with home-made rennet :—

521	gal. into	Cheddar.	240	gal. into	Caerphilly.
50	,,	Cheshire.	800	,,	Soft Cheese.
98	,,	Smallholder.	87	,,	Derby.
296	,,	Kingston.			

All the cheeses made from this milk ripened normally, and were of good quality. Two rennet extracts were used, one of which was nine and the other seven months old.

Some of the experimental results obtained are shown in Table I.

This table shows the results obtained when dealing with two batches of vells called Nos. 4 and 5. The first batch, No. 4, contained 20 vells, 15 of which were placed in 1 gal. and 5 in ½ gal. of brine, and labelled, respectively, 4 (15) and 4 (5). The other batch contained 23 vells, 15 of which were placed in 1 gal. and 8 in ½ gal. of brine, and labelled, respectively, 5 (15) and 5 (8). The experiment was begun on the 17th August,

1916. Eleven days after being placed in brine the vells were scraped, and after the scrapings had been allowed to remain in the brine for another two days the extracts were filtered through cotton-wool in the usual way, having first been poured through fine cheese calico to free them as far as possible from

TABLE I.—*Results of Successive Coagulation Tests made on Rennet Extracts, September*, 1916, *to March*, 1917.

Ref. No. of Extract.	Vells put in Brine.	Date of Test.	Test.	Date of Scraping.	Date of Filtration	Date of Test.	Test.	Date of Test	Test.	Date of Test.	Test
	1916	1916.	min. sec.	1916.	1916.	1916.	sec.	1916.	min. sec.	1916.	sec.
4 (15)	Aug. 17	Aug. 21	1 2*	Aug. 28	Aug. 30	Aug. 31	46	—	—	Oct. 24	28
4 (5)	Aug. 17	Aug. 24	1 43†	Aug. 28	Aug. 30	—	—	Sept. 5	1 1	Oct. 10	39
5 (15)	Aug. 17	Aug. 21	1 57*	Aug. 28	Aug. 30	—	—	Sept. 5	0 52	Oct. 24	26
5 (8)	Aug. 17	Aug. 24	1 17†	Aug. 28	Aug. 30	—	—	Sept. 5	0 46	—	—

Ref. No. of Extract.	Vells put in Brine,	Date of Test.	Test.	Date of Test.	Test.	Date of Test.	Test.	Date of Test.	Test.	Date of Test.	Test.
	1916.	1916.	sec.	1916.	sec.	1916.	sec.	1917.	sec.	1917.	sec.
4 (15)	Aug. 17	Nov. 10	30	Nov. 17	27	Nov. 24	30	Jan. 27	35	Mar. 14	31
4 (5)	Aug. 17	—	—	Nov. 17	36	Nov. 24	37	Jan. 27	41	Mar. 14	36
5 (15)	Aug. 17	Nov. 10	27	Nov. 17	22	Nov. 24	26	Jan. 27	29	Mar. 14	27
5 (8)	Aug. 17	Nov. 10	31	Nov. 17	24	Nov. 24	37	Jan. 27	29	Mar. 14	24

* Acidity of milk, 0·19 per cent. † Acidity of milk, 0·185 per cent.

fragments of mucous membrane which cause the filtering process to be very slow. Coagulation tests were made on these four extracts from time to time as shown in the table, and seven months after the experiment had begun the rennets gave tests of 31, 36, 27, and 24 seconds respectively. These

results show not only that extracts prepared in this way can be kept for very much longer than was stated in our previous papers, but also that instead of deteriorating with storage they become considerably stronger, so that at the end

TABLE II.—*Coagulation Tests and Bacterial Examination of Rennet Extracts, November*, 1916, *to March*, 1917.

Ref. No. of Extract.	Vells put in Brine.	Date of Test.	Test.	Date of Test.	Test.	Date of Test.	Test.	Date of Test.	Test.	*B. Coli* found in
	1916.	1916.	sec.	1916.	sec.	1916.	min. sec.	1916.	sec.	
8 (Large) ..	Sept. 25	Oct. 6	45	Oct. 23	31	Nov. 7	0 26	Nov. 11	29	1/100 cc.
8 (Small) ..	Sept. 25	Oct. 5	55	Oct. 23	32	Nov. 7	0 26	Nov. 11	30	1/1,000 ,,
9 (10)	Oct. 24	—	—	—	—	Nov. 1	1 9	Nov. 11	32	1/10,000 ,,
9 (11)	Oct. 24	—	—	—	—	Nov. 1	1 20	Nov. 11	57	1/10,000 ,,

Ref. No. of Extract.	Vells put in Brine.	Date of Test.	Test.	*B. Coli* found in	Date of Test.	Test.	*B. Coli* found in	Date of Test.	Test.	*B. Coli* found in
	1916.	1916.	sec.		1916.	sec.		1917.	sec.	
8 (Large) ..	Sept. 25	Nov. 18	29	1/1,000 cc.	Nov. 25	23	Absent.	Jan. 16	28	Absent.
8 (Small) ..	Sept. 25	Nov. 18	28	1/10,000 ,,	Nov. 25	23	1/10,000 cc.	Jan. 16	27	,,
9 (10)	Oct. 24	Nov. 18	31	1/10,000 ,,	Nov. 25	30	1/10,000 ,,	Jan. 16	34	1/10 cc.
9 (11)	Oct. 24	Nov. 18	25	1/10,000 ,,	Nov. 25	35	1/1,000 ,,	Jan. 16	31	1/1,000 ,,

Ref. No. of Extract.	Vells put in Brine.	Date of Scraping.	Date of Filtration.	*B. Coli* found in	Date of Test.	Test.	*B. Coli* found in	Date of Test.	Test.	*B. Coli* found in
	1916.	1917.	1917.		1917.	sec.		1917.	min. sec.	
8 (Large) ..	Sept. 25	Jan. 19	Jan. 29		Feb. 6	29	Absent.	Mar. 14	0 32	Absent.
8 (Small) ..	Sept. 25	Jan. 20	Jan. 29		Feb. 6	29	1/10 cc.	Mar. 14	0 32	,,
9 (10)	Oct. 24	Jan. 19	Jan. 29		Feb. 6	35	Absent.	Mar. 14	1 10	,,
9 (11)	Oct. 24	Jan. 19	Jan. 29		Feb. 6	31	,,	Mar. 14	0 31	,,

of seven months these particular extracts were of approximately the same strength as commercial rennet. In two cases only has the strength of the rennet extract been found to decrease appreciably on keeping. In one case the vells had a very offensive smell at the time of their arrival at the laboratory, and though the extract increased in strength for

about two months, it then became too poor for use. The second case was that of a batch of vells in the second steeping of brine, to which no boric acid had been added in either the first or second steeping.

Table II. shows the results obtained from two batches of vells, Nos. 8 and 9. Batch 8 contained 40 vells which differed in size very considerably and which were roughly separated into large and small. The 20 larger ones were placed in 1 gal. of brine and the 20 smaller ones in a second gallon. Batch 9 contained 21 vells, of which 10 were placed in one half gallon and 11 in a second. These were labelled, respectively, 8 (large), 8 (small), 9 (10) and 9 (11). Since these extracts were made we have found that quite good rennet may be made by using 15 vells to 1 gal. of brine, and in all later work this number has been used.

In this experiment not only were coagulation tests carried out, but the extracts were also examined periodically for organisms belonging to the *B. Coli* group. Sterile tubes of lactose-peptone-water were inoculated with quantities of the extract varying from 1 cc. to $\frac{1}{10,000}$ cc. and incubated at 37° C., the tubes being examined after 2 and 5 days for presence of acid and gas. The results show that the organisms gradually died out as the extracts got older, and that at the end of six months, no milk sugar fermenting organisms are found in any of the extracts. As before, the strength of the rennet increased with storage up to 5 months, after which a slight deterioration set in in three out of four extracts. Whether, with the crude coagulation test at present in use, such small changes have any real significance is not known, but further experiments will be carried out on this question.

A few words may be said about one of those batches of vells which were dealt with in the previous paper, namely, the second batch of fresh vells, which were tried with and without boric acid at the rate of 10 vells to 1 gal. of brine, the vells not being scraped. The results of the coagulation tests for these extracts are given in Table III.

After 9 months the strength of these extracts was maintained, and lactose-fermenting organisms were absent in 1 cc. From the results given in the three tables above, it will be evident that the extracts from different batches of vells vary considerably in their coagulating properties.

Summary.—(1) It has been shown possible to obtain by the method described, rennet extracts of a strength which not infrequently approximates to that of commercial rennet.

(2) These extracts retain their coagulating properties for a period of several months.

(3) The strength of the extracts is frequently found to increase during the period of storage.

TABLE III.—*Coagulation Tests on Extracts from Fresh Vells, July, 1916, to March, 1917.*

Ref. No. of Extract.	Vells put in Brine.	Date of Test.	Test.	Date of Test.	Test.	*B. Coli.*	Date of Filtration.	Date of Test.	Test.	*B. Coli.*	Date of Test.	Test.	*B. Coli.*
2 (with Boric) ..	1916. June 16	1916. June 18	Not in	1916. July 10	min. sec. 2 35		1916. July 12	1916. July 16	min. sec. 2 30		1917. Mar. 13	—	sec. —
2 (without Boric) ..	June 16	June 18	5½ min.	July 10	1 58		July 12	July 16	1 52		Mar. 13	Oct. 24	52
2 (with Boric) ..	1916. June 16	1916. Nov. 9	sec. 54	1916. Nov. 16	min. sec. 0 52	Absent	1917. Jan. 26	sec. 44	Absent		1917. Mar. 13	sec. 47	Absent
2 (without Boric)	June 16	Nov. 9	46	Nov. 16	1 23	,,	Jan. 26	44	,,		Mar. 13	48	,,

(4) The number of lactose fermenting organisms (evidence of dirt contamination) in the extracts diminishes with time.

(5) Numerous cheeses made from more than 1,300 gallons of milk by the use of these extracts have proved entirely satisfactory.

EXPERIMENTS WITH PEPSIN TO REPLACE RENNET.

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IN a previous communication* the results of a few preliminary tests with pepsin were summarised. It was desired to produce a pepsin solution which would keep fairly well and which would give the same results as rennet extract when used in the same way. Success was obtained in preparing a solution of pepsin which, when added to milk in the proportion of 1 drachm to 3 gal., gave a curd firm enough to cut in 1 hr. at 84° F. In this respect the pepsin solution gave the same result as a British brand of rennet used in the same way. The pepsin cheeses when sold were in every respect as good as the rennet cheeses. The (purchased) milk then received in the dairy was already fairly ripe, and Miss Prichard added ½ per cent. of starter for making the experimental Caerphilly cheeses. These experiments suggested that a standard rennet extract could be prepared by mixing the following ingredients (by weight) :—

8·3 of 1–3,000 soluble pepsin powder, 2·0 of boric acid, and 20 of salt, to 100 of water.

The experiments have been continued with the co-operation of Miss H. M. Williams, N.D.D., B.D.F.D., and students. A filtered pepsin solution prepared as before was compared with Danish rennet extract, the dairy's supply of the British brand having been exhausted. The tests were conducted with 6 and 12-gal. vats of milk, the milk being subsequently worked up into Caerphilly and truckle Cheddar cheeses respectively. The first few tests at 84° F. gave the following results :—

	Rennet.	*Pepsin Solution.*
Amount used	1 drachm to 3 gal. in each case.	
No. of tests	14 ..	6
Time till curd was cut—		
Maximum	1 hr. 40 min. ..	3 hr. 48 min.
Average	1 „ 13 „ ..	2 „ 22 „
Minimum	35 „ ..	1 „ 25 „

These figures at once showed that the substitute had very different properties from rennet extract. Reference to the cheese records showed that at least ½ per cent. of starter had been added to each lot of milk. The milk now coming into the dairy had an acidity of quite 0·2 per cent. (calculated as lactic acid), yet rennet tests showed that it was comparatively sweet milk (30–40 seconds, using 1 drachm to 4 oz. of

* *Journal*, April, 1917, p. 57.

milk at 84° F.). The ripeness of the milk was probably the factor governing the results, and the following experiment with 3 vats of milk confirmed this view :—

	Vat 1.	*Vat 2.*	*Vat 3.*
Starter added (per cent.)	2	1	½
Time ripened at 84° F.	½ hr.	1 hr.	1 hr.
Rennet test of ripe milk	26 sec.	26 sec.	?
Pepsin solution added to each vat : 1 drachm to 3 gal.			
Time till curd was cut	1 hr. 40 min.	1 hr. 40 min.	2 hr. 40 min.

In the following tests a ripeness giving a 20-sec. rennet test was aimed at. This usually required about 2 per cent. of starter and an hour of ripening :—

1. Rennet, 1 drachm to 3 gal. at 84° F.—

Ripeness of Milk.	*Time till Curd was Cut.*
19 sec.	45 min.
20 ,,	55 ,,
20 ,,	60 ,,
22 ,,	40 ,,
19 ,,	61 ,,
21 ,,	47 ,,
Average .. 20 sec.	51 min.

2. Pepsin solution, 1 drachm to 3 gal. at 84° F.—

Ripeness of Milk.	*Time till Curd was Cut.*
20 sec.	63 min.
19 ,,	65 ,,
22 ,,	63 ,,
19 ,,	60 ,,
20 ,,	56 ,,
20 ,,	65 ,,
Average .. 20 sec.	62 min.

There is, of course, a considerable experimental error in these tests, but errors were eliminated as far as possible, and it is considered fortunate that such uniform results were secured in this series. The rennet tests were made with rennet extract. (In a few cases " rennet tests " were also carried out with the pepsin solution. The results of these investigations indicated the peculiar deduction that while the pepsin solution might give a somewhat quicker " rennet test " in these ripe milks, yet it acted a little slower in the bulk of milk.)

Pepsin is very much more sensitive to slight differences in the degree of ripeness of the milk than rennet extract. For this reason it is more difficult to use successfully, though it is cheaper. Good results, however, can be obtained with pepsin. One ounce of 1-3,000 soluble pepsin powder can coagulate 300 gal. of well-ripened milk, but evidently only half that quantity of milk ripened to a less degree.

In these circumstances it is interesting to find how pepsin behaves in sweet milk. The following tests were conducted with 1-gal. lots of milk, each subsequently made into a Smallholder cheese. The rennet was measured with a pipette marked off in hundredths of 1 c.c. and the temperature in each case was 84° F.

1. Sweet milk as purchased : rennet test, 32 sec.
 ⅓ dm. of rennet : curd cut in 1 hr. 15 min.
 1 ,, of pepsin solution : curd cut in 1 hr. 40 min.
2. Sweet milk as purchased : rennet test, 30 sec.
 ¼ dm. rennet : curd cut in 1 hr. 30 min.
 ½ ,, ,, ,, ,, 22 ,,
 1½ ,, pepsin solution : curd cut in 1 hr. 18 min.
 1 ,, ,, ,, 2 ,, 3 ,,

These data are too scanty to be conclusive, but they suggest that 1 oz. of soluble pepsin powder will curdle only 75 gal. of " fresh " milk.

Good ripe Caerphilly, Smallholder, truckle Cheddar and Pont L'Évêque cheeses have now been made at Cardiff with pepsin, and in all cases the ripening was apparently normal. Mr. R. J. Drummond, of the Kilmarnock Dairy School, has evidently made successful Cheddar cheese with pepsin (reported in the *Scottish Farmer*) but he points out that serious risks are run by those using pepsin, as it requires to be carefully handled and thoroughly standardised.

THE WORK OF AGRICULTURAL EXECUTIVE COMMITTEES.*

Most of the Committees have now been at work for a month or more, and it is possible to get some idea of the general result of their activities. In this article it is proposed to deal with that part of their work which concerns the organisation of Committees and Sub-Committees and their duties under the Cultivation of Lands Orders.

1.—**Organisation of Committees.**—The chief variations in organisation seem to lie in the relations between the County Executive Committees and the District Committees. To get satisfactory and useful work out of District Committees three conditions seem, by general consent, necessary.

(1) They must be given definite, specific work to do by the County Executive Committee. They will not usually find work for themselves.

* This article has been issued as Bulletin No. 1, Series B, by the Food Production Department of the Board.

(2) They must meet at regular intervals, preferably once a week, so that their members regard the meetings as a fixed engagement.

(3) Their work must be well co-ordinated with that of the County Executive Committee.

It is in the third of these conditions that there is room for variation in detail. Reports from different counties show not only that relations between the County Executive and the District Committees, as a matter of fact, are not everywhere the same, but also that a system which works well in one county needs revision in another. Indeed, as so often is the case, it is men and not measures that count.

Of several types of organisation, the following may be noted.

(*a*) The Chairmen of the District Committees form the Executive Committee, with or without the addition of other members.

(*b*) The Executive Committee is first formed, and the District Committees derived from it, each individual member of the Executive undertaking to act as chairman of one or more District Committees. The Executive officer of the Executive or his assistant often acts as secretary of the District Committees.

(*c*) The Executive and the District Committees are quite distinct, the District Committees having their own Chairmen and Secretaries who are not members of the County Executive. In this case, a weekly letter each way seems desirable.

Whatever type of organisation is adopted, it is essential that the County Executives should see that the District Committees have regular work to do. As one commissioner writes: "It is useless to create a Local Committee and expect it to remain in active existence unless definite and continuous work for it is provided."

The arrangement of work has been helped by the decision of the Board that grants of money can be made to the Secretaries of District Committees. A Commissioner writes: "The Board's circular with reference to honorariums is likely to encourage better work from District Committees. My Committee took immediate action on the circular, and decided to grant sums to their district clerks varying from £15 to £20 each."

If doubt exists about the efficiency of the Local Committees, it is well to hold an enquiry. This has already been done in some cases. Thus in a southern county: "At a meeting of the Executive on the 5th inst., a report was read by the Hon. Secretary with regard to the work of the District Committees.

There are twenty-two District Committees in the county, and the work of 10 of these was reported as good, seven as fair, and the remaining five as very indifferent. The Executive decided to take strong action in the matter, and, at the suggestion of the District Commissioners, the secretary was instructed to address letters to the offenders informing them that the Executive considered their work most unsatisfactory, and that, unless an improvement took place at once, they would be superseded."

One special point seems to need some attention: The co-operation between the men's and the women's committees, especially over labour problems. Thus one of the Commissioners reports: "At present there seems to be a want of co-ordination between the two sides of the work, *i.e.* those of the men's and the women's Committees."

But in many places the District Committees are already doing well, and are steadily improving in effectiveness. For instance, in a south-eastern county, the Commissioner reports: "The District Sub-Committees are as a rule doing excellent work; the report sent in by one Committee is a model of what such reports should be." Again, in a north-midland county, the Commissioner writes: "The District Committees now meet each week at regular times; weekly reports are sent in to the Executive Committee. . . . The Chairman of the District Committees present at the meeting of the Executive reported that their Committees were taking a great interest in the work; and it was felt that the Executive Committee would soon be in a position to review week by week the work going on throughout the county, to locate the weak places, to use the means at their disposal for the purposes of strengthening the organisation in such places, and so aim at bringing results throughout the county up to the standard set by the most active and thoroughgoing of the District Committees."

With regard to the work of the Executive Committees themselves, the reports from the different counties are on the whole satisfactory. The Executives meet regularly, at least once and in several counties twice a week. In some places, the Chairman or other members attend the office day by day to deal with routine work as it comes in. While some Executives are more effective than others, as a rule they seem to be acquiring a knowledge of their work and a firm grip of the business which comes before them.

2.—**The Cultivation of Lands Order.**—The administration of the Cultivation of Lands Orders is the most important and most delicate duty of County Executive Committees.

It is of course most essential that the Committees should obtain accurate and unbiased opinions on which to found their action. Here difficulties begin. One of the chief troubles is well illustrated by the two following extracts from reports of Commissioners on the working of the District Sub-Committees and their survey of lands. One Commissioner says: "The Local Committees . . . are, in my opinion, not manned sufficiently by practical farmers. Consequently a good deal of time is wasted in dealing with their reports, as they have to be referred back to a special panel of practical farmers and a valuer."

But the alternative view is expressed by another experienced Commissioner a week later. He says: "It is not easy to persuade Committees, most of the members of which are farmers, of the necessity of getting information as to the condition of the farms of their brother farmers, or of the importance of anything else than making things easy by providing labour, machinery, etc., for cultivation."

When the facts are ascertained, many possibilities lie before a County Executive Committee.

(1) *Advice and Recommendation.*—A mere recommendation is often enough to secure improved cultivation. "In the majority of instances," writes a Commissioner, "the farmers agree to carry out the suggestions of the Executives," and most other Commissioners report to the same effect. One County Executive, with a shrewd knowledge of human psychology, sends to the farmer concerned a form with a polite recommendation displayed on its face, and a list of the summary compulsory powers, which the Committee hold in reserve, modestly set forth on its back. The results are said to be satisfactory.

When the present occupier agrees to carry out the recommendations of the Executive, it is necessary to watch the progress of the changes, and to see that promises are performed. Here especially the District Committees can be useful.

(2) *Action by Consent.*—If a farmer is unable to fulfil the requirements of the Executive, it becomes necessary to take steps to supplement his efforts or to replace him by a more effective substitute. This can often be done by agreement. The Committee can help him by carrying out specific acts of cultivation, or by taking over or transferring to a neighbour some of his land—for instance the arable part of his farm, leaving him to deal with the grass.

When a tenant is thoroughly incompetent or unwilling, his tenancy must be determined summarily. Before invoking the powers of the Board of Agriculture, it is often possible to carry

through the matter by agreement between owner and tenant under the advice and pressure of the Committee. A satisfactory tenant can then be installed, the owner may elect to farm the land himself, or the Committee may, as a last resort, undertake the cultivation.

(3) *Compulsion.*—When all else fails, it becomes necessary to use compulsory powers. And here the same courses are open to the Committee as in action by consent. They can direct the farmer to carry out an improved system of cultivation under penalties for non-compliance; they can enter and carry out specific work, such as ploughing or the application of manures, and recover the cost from the occupier; they can transfer part of his land to a neighbour or other substitute; they can ask the Board summarily to end the tenancy, replacing the man by someone more efficient, or farming the land themselves. In these cases, to prevent hardship, it is sometimes possible to leave the old tenant in possession of the house for a time.

Reports show that Executive Committees are taking action in all of these ways. Advice and persuasion are being used in numberless cases, and, where those methods fail, most Committees have no hesitation in applying some of their more drastic powers.

From one week's Reports from different counties the following examples of the action of Executive Committees may be given:—

"Arrangements have been made to take possession of one farm of 103 acres which was very badly reported on. About 200 notices have been served for improved cultivation for the 1917 crop, affecting approximately 3,000 acres. Notices have also been served for the breaking up for the 1917 crop of poor grass land, and land which has been allowed to go out of cultivation. It is expected that an increased acreage of approximately 2,000 acres will be obtained."

"It was decided to issue a warning that unless marked improvement took place in cultivation before 1st July . . . the Committee would take steps to terminate the tenancy."

"The Commissioner advised that the Committee should formally enter on the land and arrange for the sowing of the crop."

"Orders to cultivate were made in six cases; and in two cases Local Authorities were authorised to take over land for allotments. The Committee have taken possession of about 25 acres of land and let it at 1*s.* an acre for two years. They have ordered that 75 acres be bare-fallowed; and have come

to an agreement with the agent of one estate that he should terminate a tenancy forthwith and secure another tenant. In another case they have taken possession of the arable land and horses and left the rest to the present occupant. One District Committee is about to cultivate 25 acres of building land for corn. An order has been made for the mole-draining of three fields on one farm."

"The Executive Committee have dealt with a great number of cases of badly cultivated farms. In some cases a letter to the landlord or his agent has produced sufficient results, in others a notice served on the occupier has had good effects, in others the tenant has proved incapable of improving his cultivation, and the arable land is taken over by the Committee. In the case of building land which is derelict the Committee is most energetic in getting it cultivated to the best advantage."

"Action was taken in the case of a farm of 224 acres . . . in an exceedingly bad state . . . It has been arranged to terminate the tenancy and the tenant who was coming in at Michaelmas will come in now."

"The Committee have a case of an 800 acre farm practically derelict for several years, and now badly infested with rabbits. It is hoped that this farm can be restored in part during the summer months for wheat sowing in autumn, but the first essential is to clear the land of vermin. The owner has been required to get this done."

"Another case was considered of an area of 40 acres which is water-logged. It was decided to serve notice upon the owner to drain in order to increase the area under cultivation for 1918."

"The Committees are taking energetic, and in some cases drastic, measures under the Order. They have given peremptory orders in several cases for additional land to be ploughed, ranging from 5 to 50 acres in each case. They have also authorised several tenants to plough where owners objected to the pastures being broken up; they have also directed some tenants to apply sulphate of ammonia to some of their crops and to sow certain acreages of wheat for next year."

"The Executive Officer has arranged with the tenants, and is directing the proper cultivation of these two farms by them."

"A young farmer of military age was reported as cultivating his farm badly. The Executive Committee decided to ask the agent of the estate to arrange for the proper cultivation of the farm by another tenant, and as soon as this was done to call the attention of the Military Authorities to the fact that this man is available for service."

A few Committees seem reluctant to use their powers even in clear cases. But on the whole, when cultivation is defective tenant farmers, owning farmers and large landowners are all being dealt with faithfully. In the case of owners, whether working farmers or otherwise, there is no question of summarily terminating a tenancy. But enough powers remain. An Order to cultivate properly can be made, and, if necessary, enforced. Thus in one county a large landowner who refused to cultivate some land in hand in accordance with the Committee's advice, was sharply brought to terms by an intimation that the Committee would prosecute " unless he complied with their Instructions " forthwith.

Even when landowners are not themselves farming any land, Committees should not overlook the possibility that they can help by putting pressure on unsatisfactory tenants. In many cases improvement on badly cultivated farms has been secured by the help of the landowner or his agent. In others, for one reason or other, it has been found that on a whole estate the standard of cultivation is below the average. When this is so, the cause should be looked into, and the owner be made to remedy it, whether it be due to mistaken kindness to old and inefficient tenants, to bad estate management, or to excess of rabbits or hares.

In conclusion one more instance where the reserve powers of the Order proved useful may be mentioned.

" The survey revealed the facts that the farm was insufficiently cultivated ; that the tenant was an old man who was giving up his farm at Lady Day, 1918 ; that he had sold his stock, including his horses and implements ; and that he proposed to let the grass land. As he was feeble, the Executive were doubtful whether they could press him to cultivate an additional acreage this spring, as such an Order would have entailed his buying horses and implements to carry it out. . . . In reply to a letter to the Agent, the Committee were informed that he could give no help in the matter as there was no incoming tenant in view." The Executive thereupon instructed the agent to terminate the tenancy, and ordered him to cultivate the land required. The Commissioner also wrote a personal letter to the Agent. Within a week the tenancy was terminated by mutual agreement and the land re-let to an excellent farmer who will stock and cultivate it properly and put in the additional area of spring corn asked for by the Committee. The Commissioner adds : " This would certainly not have happened but for the ' Lands Cultivation Order.' "

THE PROFITABLE UTILISATION OF SURPLUS MILK.

AN APPEAL FOR CHEESE-MAKING.

THE President of the Board of Agriculture and Fisheries desires to call the attention of farmers and cowkeepers to the national importance of the maintenance and economical utilisation of milk supplies.

The primary object of all milk-producers must be the production of adequate supplies for human consumption, particularly for the feeding of children and invalids. Milk is most economically utilised when it is consumed as whole milk.

The whole supply cannot be utilised in this way, since some of the milk must be reserved for purposes of calf-rearing. The amount used for this purpose need not be very great, since it is now well known that calves can be reared successfully from about the third week of life without milk of any kind (see Leaflet No. 142 and Technical Bulletin No. 8, Series C).

There are many farms, however, from which it is not possible to dispose of the whole of the milk for direct human consumption, and alternative methods for its disposal have to be adopted. Again, there are dairies in which at times the supplies of milk exceed the demands for human consumption as such. In all such cases it must be the endeavour of the farmer or dairy manager to convert this surplus milk, however small in quantity, into marketable forms of human food. Various alternative methods can be adopted for this purpose.

1. **Feeding to Stock for Production of Veal or Pork.**—This method is only mentioned in order that it may be condemned outright as probably the most wasteful of all methods. So little human food is produced in this way in proportion to the milk consumed that the practice cannot be too strongly deprecated even in normal times, and in these days it must be quite ruled out.

2. **Manufacture of Condensed or Dried Milk.**—A second alternative is to convert the milk into the concentrated form of *condensed milk*, or, better still, *dried milk*. In these forms the whole of the nutriment of the milk is rendered available for human consumption, but their preparation requires special and complicated machinery such as only a factory can provide.

3. **Butter-making.**—A third method of utilising surplus milk is to convert it into butter. In this way the milk is separated into two products, butter and skim (or separated) milk, both suitable and valuable foods for human consumption. The food value of the milk is about equally divided in amount between the two products, but whereas the butter contains practically only fat from the milk, the skim or separated milk contains the muscle and bone-forming ingredients, along with a small proportion of the fat. Where *both* products can be transmitted direct to the consumer there is very little waste involved in butter-making, but where, as is commonly the case, only the butter can be so transmitted the economy of the process is very different, since not only does the consumer of the butter receive barely one-half of the food-value of the original milk, but he misses some of the most valuable ingredients. In such cases the skim milk is commonly fed to stock and yields eventually only a fraction of its nutriment in the form of meat.

Some realisation of its food value is secured if the skim milk be converted into *skim milk cheese*, but such cheese rarely commands a satisfactory market and cannot be generally recommended. Information on this subject is given in Technical Bulletin No. 6, Series C.

4. **Cheese-making.**—The fourth method of utilising surplus milk is by its direct conversion to *cheese.*

When milk is converted into cheese a compact, durable, marketable product is obtained containing fully two-thirds of the nutriment of the milk and including not only the bulk of the fat but also the greater part of the muscle and bone-forming ingredients. Little more than the sugar of the milk is left in the whey. Compared with butter-making, therefore, cheese-making not only effects a greater recovery of the food-ingredients of the milk, but gives a good food which will keep longer and is much better adapted to meet the varied needs of the body than butter. The shrewd farmer will also bear in mind that butter is subject to the competition of an excellent substitute in the form of margarine, and that with the enormous impetus given to the consumption of the latter it will be increasingly difficult after the War to secure a margin of profit in butter-making.

The imports of cheese into Great Britain before the War amounted year after year to fully 120,000 tons, so that an immense market is obviously open to the British cheese-

maker, and a large, permanent and remunerative extension of the industry is possible.

In view of these various considerations, therefore, every farmer or dairy manager is urged to make cheese from all the milk which is not indispensable for calf-rearing or cannot be disposed of for direct human consumption.

With a view to securing a rapid extension of cheese-making, the Board have taken steps to augment the supply of cheese-making apparatus available, and most County Education Authorities have now made special provision for instruction in cheese-making. Farmers wishing for advice and guidance, or for the services of an instructress, should, therefore, make applications to their County Education Authorities.

Very small quantities of milk can be made into cheese, but the kind of cheese which can be most profitably undertaken will depend on the amount of milk available and the local markets. For guidance in this matter and more detailed information on the manufacture of cheese from whole milk, reference should be made to Special Leaflet No. 41, and Leaflets Nos. 179 and 231.

Use of Whey.—In order to complete the case for cheese-making it is necessary to deal with the utilisation of the whey which is obtained as a by-product. The farmer who contemplates the substitution of cheese-making for butter-making will doubtless feel some anxiety as to how his calf-rearing is likely to be affected by the loss of the skim (or separated) milk which the butter-making leaves at his disposal. Since the cheese removes more of the nutriment of the original milk than butter does, the whey must be correspondingly inferior in feeding value to the skim milk. There is a common tendency, however, to over-rate the necessity of skim (or separated) milk for calf-rearing and to underrate the nutritive value of whey.

In cheese-making districts farmers have found it possible to rear satisfactory calves by beginning with whole milk for two or three weeks only and then gradually replacing it by a mixture of whey and suitable meals. The replacement may be completed within three weeks (*i.e.* by the age of six weeks), by which time the calf will take 1 to 1½ gal. of whey per day.

With regard to the meals required to supplement whey, good results have been obtained with (*a*) a mixture composed of one-third fish meal and two-thirds oatmeal (by weight); and (*b*) with palm-nut meal. It should be remembered, however, that in the national interest the use of oats (and also

of maize, beans and peas) for stock feeding should be restricted within the narrowest possible limits.

When the mixture of fishmeal and oatmeal is used, it is best fed as a porridge made with boiling water, and it is suggested that a start should be made to feed this porridge when the calf has attained the age of three weeks by introducing a little of it into the pail before the calf has quite finished its feed of milk.

From this time onwards the amount of porridge given should be daily increased, accompanied at the same time by a corresponding decrease in the quantity of milk allowed, and the gradual introduction of a daily feed of fresh whey, so that by the time the calf is six weeks old the consumption of milk has been eliminated, and, in place thereof, each calf is receiving ½ lb. of mixed meal (in the form of porridge) and 1 gal. of whey per day. From six weeks onwards the quantities fed should be increased until 1 lb. of mixed meal and 1½ gal. of whey are consumed per head per day.

Good hay should be allowed *ad lib.*, and from the age of eight weeks linseed cake should be fed, commencing with about a ¼ lb. per head per day, this quantity being gradually increased until each calf gets ¾ lb. per day.

When palm-nut meal is used to supplement whey, the procedure advised is similar to that recommended in the case of the mixed meal, except that the palm-nut meal is not fed as a porridge. It is rather more difficult to get calves to take to palm-nut meal, but once the initial period has been overcome, no further difficulty as a rule arises. To begin with, a little palm-nut meal should be introduced into the milk pail just before the calf has finished its feed. This start is made at the age of three weeks; in this way the calf will usually acquire a liking for meal, and from this time forward the meal may be fed dry.

The quantity of meal given daily should be gradually increased, more and more fresh whey should be fed, and the daily allowance of milk correspondingly decreased, until by the age of six weeks each calf is receiving 1 gal. of whey, ½ lb. of palm-nut meal, and no milk.

From this stage both the whey and the palm-nut meal should be gradually increased until 1½ gal. of whey and 1 lb. of meal are consumed per head per day.

The palm-nut meal should be fed dry immediately after the whey has been given. In this case also, good hay should be given *ad lib.*, and linseed cake, starting with ¼ lb. and finally reaching ¾ lb. per day, should be fed from the age of eight weeks.

Less satisfactory results were obtained with a mixture of equal weights of linseed meal, oatmeal, fine thirds, and pea meal. Very starchy materials, such as maize, should generally be avoided and preference given to foods, such as the above, which supply a fair quantity of oil along with the albuminoids.

Where the whey is not required for calf-rearing it can be profitably utilised for pig-feeding.

Conclusion.—To sum up the advantages of cheese-making as compared with butter-making: cheese-making gives direct

to the human consumer a greater proportion and a greater variety of the food materials contained in the milk; it is usually more remunerative, and is likely to remain so in view of the rapidly increasing competition of margarine with butter; it gives a more durable product capable of prolonged storage; and the accompanying whey, though less nutritious than skim or separated milk, can still be used satisfactorily for the purposes of calf-rearing or pig-feeding.

Copies of the Leaflets referred to may be obtained free of all charge on application on an unstamped postcard to the Board of Agriculture and Fisheries, 3, St. James's Square, London, S.W. 1; and of the Bulletins on a similar application to the Food Production Department, 72, Victoria Street, London, S.W. 1.

Scheme for the Land Settlement of Ex-Service Men.

IT is proposed to establish four experimental Small Holdings Colonies in England and Wales of a total area not exceeding 6,000 acres for the land settlement of ex-Service men.

These colonies will be of three different types, viz. mixed farming, dairying and market-gardening.

Each colony will consist of a central farm, and of a number of small holdings, varying in extent according to soil and nature of cultivation, but usually not exceeding 50 acres.

The central farm will be under the management of a director, and will be equipped with machinery, implements, horses, etc., which will be let out on hire to settlers requiring them. It will, in the first instance, embrace the greater part if not the whole of the estate, and will be so laid out that portions of it may be taken away from time to time for increasing, within limits, the area of the small holdings as the growing ability and capital of their tenants justifies such addition.

Selected applicants who have had little or no previous experience will be given preliminary training on the central farm under the supervision of the director, receiving a fair living wage until such time as they are considered capable of taking up land for themselves. They will then be allotted land near their cottages, the area of which may subsequently be increased, as mentioned above, by taking land from the central farm.

Applicants who are able to satisfy the Board that they have the necessary capital and experience may be allowed to take up holdings without preliminary training.

Co-operative methods will be adopted for the purchase of requirements, and the consignment and disposal of produce.

It must be clearly understood that the Government do not propose to make direct advances of capital to ex-Service men desirous of taking up holdings, but it is hoped that industrious men, even if possessed of but little capital of their own, by starting as workers on the central farm and at the same time cultivating a small plot on their own account, may gradually be able to increase the area under their own control until they are able to support themselves entirely from this source.

Endeavours will be made to establish a system of co-operative credit in connection with each colony, to assist men of this class.

In the selection of settlers for the three colonies preference will be given, as between men of equal merit and qualifications, to those whose wives or sisters or daughters have, as the result of their employment on the land either before or during the War, acquired proficiency in milking or other farming operations.

1. **Particulars of Estates already Acquired.**—Under the scheme outlined above the following estates have already been acquired :—

(i.) *Crown Colony, Patrington.*—This estate comprises 2,363 acres of deep alluvial land capable of producing very heavy crops.

It is situated near Patrington in the East Riding of Yorks, about 15 miles distant from Hull. Vacant possession was obtained on 6th April, 1917.

When fully developed it will consist of a central farm of about 200 acres and 60 small holdings of " mixed farming " type averaging about 35 acres in extent. The equipment of each of the latter will include a comfortable cottage and the necessary buildings for carrying on the holding.

The Y.M.C.A. have promised to erect a hut for the use of the settlers on the Colony.

(ii.) *Crown Estate, Holbeach Marsh.*—This Estate consists of 1,000 acres near Holbeach, in the Holland, or Southern, Division of Lincolnshire.

The soil is a rich alluvium capable of producing very heavy crops.

Vacant possession will be obtained at 11th October, 1917.

This Colony when fully developed will consist of a central farm of about 200 acres and 80 small holdings of " market gardening " type, averaging about 10 acres in extent. The

equipment of each of the latter will include a comfortable cottage and the necessary buildings for carrying on the holding.

2. **Particulars of Estates Proposed to be Acquired.** — The Board have under consideration the acquisition of a third English Colony, preferably in the Southern or Western counties of England, comprising from 1,100 to 1,200 acres, which it is expected will accommodate about 40 settlers.

Steps are also being taken to acquire an estate in Wales, consisting of about 1,500 acres, which it is anticipated will provide for the requirements of 60 small holders.

The sites of these two additional Colonies have not yet been selected.

Forms of application for holdings on these Colonies can be obtained from the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. 1.

Thistles in Corn.

FROM many quarters come reports of the abnormal quantity of thistles in our cornfields this year; and farmers would do well to give their prompt attention to this matter. Thistle spudding is work within the capacity of women and children; and the utmost possible use should be made of this source of labour. Farmers who have difficulty in getting the necessary help should at once write to the Secretary of the County Agricultural Executive Committee.

There are several reasons, personal and patriotic, why farmers should spud thistles in their corn as soon as possible. One of them is the special need of providing this year the maximum yield of grain—which cannot be done on thistle-infested land. Another is the necessity for saving labour later on, particularly in view of the likelihood of the farmer having to take a second crop of corn from the same field. Again, the stocks of hay in the country are small and may be smaller next winter and spring; and the supply of concentrated feeding stuffs is also short. Therefore more straw than usual will have to be used for the feeding of stock. Apart from all these points, there is the further circumstance that not only will much of the forthcoming hay crop be required for the Army, but much straw as well. It is obvious, therefore, that patriotism and enlightened self-interest both dictate the early and drastic destruction of thistles on our corn lands.

THESE notes give suggestions for the use of feeding stuffs for various kinds of live stock from the present time to the end of July. The prices, of course, refer to June, but in the suggestions an attempt is made to look ahead.

Notes on Feeding Stuffs for July: *From the Animal Nutrition Institute, Cambridge University.*

The trend of prices since May shows that the shortage of certain feeding stuffs is becoming more acute. For instance, on account of the milling and brewing Orders, millers' and brewers' offals are becoming very scarce, and the price still continues to rise. Beans and peas are also becoming dearer. Barley and oats, for which the price was fixed some time ago, remain as last month. Cakes have also remained fairly steady in price since the importation of oil seeds came under Government control.

Horses.—Since last month the Food Controller has taken in hand the question of oats for horses, and has issued an Order, The Horses (Rationing) Order of 11th May,* forbidding the use of oats and other cereal foods for horses not engaged in productive work, and limiting the amount of oats to be used for all classes of horses. The scarcity of oats is very great, and of the small supply an increasing proportion is required for human food. The following foods may be used to replace oats in the proportions stated:—

10 lb. oats may be replaced by 14 lb. bran, 10 lb. pollards, 12 lb. dried grains, 7 lb. maize, 9 lb. beans or peas, or 8 lb. linseed cake.

No single one of these foods should be used as a substitute for oats. It is much safer to use a mixture as suggested in past issues of these notes.

Farm horses at grass should not get more than the equivalent of 6 or 7 lb. of oats a day, and this quantity should be reduced when they are doing no work.

Idle horses should get no dry food.

Milking Cows.—Milking cows will now have been at grass long enough to be free from risk of scouring. For the present they should require no cake or food other than the grass. Owners should, however, watch the grass if the weather keeps dry, and if it shows signs of getting short, endeavour to supplement it with any green stuff which is available, or, in the last resort, with some kind of cake. The cheapest cake for this purpose at the present time is ground nut cake. Palm kernel cake, coconut cake, and linseed cake are also suitable, but rather dearer.

* See p. 362.

Cattle for Beef Production.—Farmers should not ignore the fact that there is at present a popular demand for fixed prices for meat. This demand is becoming so insistent that fixed prices may be expected very soon : quite possibly before these notes are printed.

Prices are not likely to be fixed at the present high level : when the public asks for fixed prices, lower prices are

TABLE I.

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of May.																	
		London.			Liverpool.			Hull.			Bristol.			Glasgow.			Leith.		
		£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Soya Bean Cake	122·3		—			—			—			—			—			—	
Decorticated Cotton Cake ..	126·3	20	17	6	21	15	0		—			—			—			—	
Decorticated Cotton Meal ..	126·3		—			—			—			—			—			—	
American Linseed Cake ..	119·0	21	0	0		—			—			—			—			—	
Indian Linseed Cake	123·1		—		21	5	0		—			—		21	15	0	21	5	0
Russian Linseed Cake	123·5		—			—			—			—			—			—	
English Linseed Cake ..	120·1	21	15	0	21	10	0	20	0	0		—		22	0	0	21	12	6
Bombay Cotton Cake ..	65·3	Nominal.			16	10	0		—			—			—			—	
Egyptian Cotton Cake .	71·9	16	12	6	17	5	0	15	10	0		—		16	10	0	16	5	0
Coconut Cake	102·6	*17	0	0		—			—			—			—			—	
Palm Kernel Cake	96·1	16	10	0	16	10	0	14	15	0		—		17	15	0	‖16	15	0
Palm Kernel Meal (extracted)	92·5		—			—			—			—			—			—	
Ground-nut Cake	145·2	18	0	0		—			—			—			—			—	
English Beans	99·5	a19	7	4	21	9	4	20	8	5		—			—			—	
		b18	19	0															
Bean Meal	99·5		—			—			—			—		24	10	0		—	
Chinese Beans	101·1	25	13	4		—			—			—			—			—	
English Maple Peas	97·2	22	4	5		—		26	13	4		—			—			—	
English Dun Peas	97·2	20	0	0		—		24	8	10		—			—			—	
Calcutta White Peas	97·5		—			—			—			—			—			—	
Karachi White Peas	97·5	27	15	6		—			—			—			—			—	
American Maize	93·8	15	17	4		—			—			—			—			—	
Argentine Maize	94·2	17	10	0		—			—		19	16	8		—		21	10	0
Maize Meal	86·5	Nominal.				—		18	15	0		—			—		22	0	0
Maize Gluten Feed	121·6	19	0	0	19	5	0		—		19	0	0		—			—	
Maize Germ Meal	99·2	18	10	0	19	17	6	18	15	0	19	10	0		—			—	
English Feeding Barley ..	83·0	3 18	4	0		—		18	9	6		—			—			—	
		4 18	1	0															
		5 19	12	0															
English Oats	75·4	3 19	15	0		—		19	15	0	21	10	0		—		19	15	0
		4 18	7	9															
		5 23	6	8															
Argentine Oats	75·4	23	19	0		—			—			—			—			—	
Malt Culms	69·9	13	0	0		—		14	0	0		—		15	0	0	15	10	0
Brewers' Grains (dried) ..	84·5	1 16	15	0		—		13	0	0		—			—			—	
		2 16	10	0															
Brewers' Grains (wet) ..	21·1	1 2	13	0		—		2	0	0		—			—			—	
		2 2	10	0															
Distillers' Grains (English) ..	101·2	17	10	0		—			—			—			—		15	10	0
Distillers' Grains (French) ..	101·2	17	10	0															
Distillers' Mixed Grains (wet)	20·0		—			—			—			—			—			—	
Egyptian Rice Meal	78·7	Nominal.				—			—			—			—			—	
Burmese Rice Meal	78·7	Nominal.				—			—			—			—			—	
Rice Bran	78·7		—			—			—			—			—			—	
Wheat Middlings (coarse) ..	92·0	15	0	0		—		14	10	0		—		16	15	0	15	5	0
Wheat Sharps	92·0	15	10	0	15	15	0	14	10	0	15	10	0	15	10	0	14	10	0
Wheat Pollards	87·0		—		14	15	0		—			—			—			—	
Wheat Bran	77·5	13	0	0		—		14	0	0	13	10	0	15	10	0	14	0	0
Wheat Bran (broad)	79·9	14	0	0	15	0	0	15	15	0	14	5	0	16	0	0	15	0	0
Feeding Treacle	60·0	19	0	0	21	0	0		—			—			—		23	0	0
Linseed	153·5	30	0	0	‡40	0	0	‡33	0	0	35	0	0		—		32	10	0
		6 58	0	0															
Linseed Oil	250·0	7 61	0	0	†60	0	0	53	10	0		—			—			—	
		8 63	0	0															
Egyptian Cotton Seed ..	108·6	19	0	0		—		19	0	0		—			—			—	
Bombay Cotton Seed ..	99·6		—			—			—			—			—			—	
Cotton Seed Oil	250·0		—		†73	0	0		—			—			—			—	
Fish Meal	145·0		—			—			—			—			—		16	0	0

Singalese Fine, £18 12*s.* 6*d.* per ton. † In barrels. ‡ Feeding ‽ Cleaned. ‖ Carriage paid to any station.
[1] Ale. [2] Porter. [3] Government. [4] Average. [5] Permitted. [6] Raw.
[7] Boiled. [8] Refined. *a* Spring. *b* Winter.

desired. Lower prices for fat cattle may therefore be expected, and the farmer should shape his policy accordingly and endeavour to make the best possible use of his grass so as to be in a position to clear out his cattle without loss, even at a lower price than he calculated on when he bought his stores.

Out of every lot of stores put on grass there will be good doers, average animals and bad doers. The good doers should be marketed for slaughter as soon as they are anything like fit. The average animals may then be pushed on with a small ration of cake: 3–4 lb. per head per day of ground nut, coconut, palm kernel or linseed cake. No attempt should be made to make any cattle prime fat; they should be sold for slaughter as soon as they can possibly be killed and others put on the grass in their place.

There is much misapprehension on this point, and some explanation is necessary. Farmers generally believe that the last stages of fattening are the most profitable to them. From the money point of view this may have been correct, for when prices had free play, the last month or six weeks may have put 10*s.* per cwt. live weight on to the price the butcher will pay for the animal, which would mean an increase of £5 in the selling price per head. This, of course, would be most profitable, for it works out at something like £1 per week for keep on grass, which does not cost more than about half-a-crown on the average.

With the fixed prices which are likely to come, however, all this is changed. It is not likely that the prices which may be adopted will allow anything extra for animals which are prime fat over and above the price fixed for average animals. Consequently the last month or six weeks will not increase the selling price per cwt. live weight, and the return for the last six weeks' keep will be the selling price of the increased live weight only. Thus if an animal puts on 5 lb. per week for the last six weeks, his selling price will increase by the price of 30 lb. of live weight at the fixed price. Suppose this is 8*d.* per lb. live weight, then the last six weeks' keep gives a return of £1 This might just pay, but it would not do so if the animal only put on 3 or 4 lb. per week instead of 5 lb., and this might easily happen.

Perhaps the following figures may make the situation clearer:—

Some years ago a long and careful series of feeding trials were carried out by the Norfolk Chamber of Agriculture. In

these trials the animals were fed on roots, straw, and cake for six months. The average live weight increases per head per week for over 100 animals were :—

1st month.	*2nd month.*	*3rd month.*	*4th month.*	*5th month.*	*6th month.*
17½ lb.	17½ lb.	17½ lb.	7 lb.	3½ lb.	1¾ lb.

For the first three months the rate of increase in live weight was over a stone a week. For the fourth month it fell to 7 lb. per week, for the fifth to 3½ lb. per week, and for the sixth to almost nothing : and this in spite of the fact that the cake ration was increased during the latter months to 10 lb. per head per day.

TABLE II.

LONDON. PRICES PER FOOD UNIT.

	s.	*d.*		*s.*	*d.*
Brewers' grains (wet) ..	2	5½	English beans, spring ..	3	10½
Ground nut cake ..	2	5¾	Linseed	3	11
Coconut cake—Singalese fine	3	1½	Brewers' grains (dried) ..	3	11¼
Maize gluten feed ..	3	1½	English dun peas ..	4	1½
Wheat middlings (coarse)	3	2	English feeding barley (average)	4	4¼
Decorticated cotton cake	3	3¼	English feeding barley (Government) ..	4	4½
Cocoanut cake—London made	3	3¾	English maple peas ..	4	7
Wheat bran	3	4¼	Egyptian cotton cake ..	4	7½
American maize.. ..	3	4½	Linseed oil (raw).. ..	4	7¾
Wheat sharps	3	5	English feeding barley (permitted)	4	8¾
Palm nut cake	3	5¼	Linseed oil (boiled) ..	4	10½
Distillers' grains (English)	3	5½	English oats (average) ..	4	10½
Distillers' grains (French)	3	5½	Linseed oil (refined) ..	5	0½
Wheat bran (broad) ..	3	6	Chinese beans	5	1
Cotton seed	3	6	English oats (Government)	5	2¾
American linseed cake ..	3	6¼	Karachi white peas ..	5	8½
English linseed cake ..	3	7½	English oats (permitted)	6	2¼
Argentine maize ..	3	8½	Feeding treacle	6	3¾
Maize germ meal ..	3	8¾	Argentine oats	6	4
Malt culms	3	8¾			
English beans, winter ..	3	9½			

TABLE III.

LIVERPOOL. PRICES PER FOOD UNIT.

	s.	*d.*		*s.*	*d.*
Wheat pollards	3	0¾	Maize germ meal ..	4	0
Maize gluten feed ..	3	2¼	English beans	4	3¾
Decorticated cotton cake	3	5¼	Egyptian cotton cake ..	4	9½
Palm nut cake	3	5¼	Linseed oil	4	9½
Indian linseed cake ..	3	5½	Bombay cotton cake ..	5	0½
Wheat sharps	3	5¾	Linseed	5	2½
English linseed cake ..	3	7	Cotton seed oil	5	10
Wheat bran (broad) ..	3	9½	Feeding treacle	7	0

TABLE IV.

HULL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	1	10¾	Malt culms	4	0
Wheat middlings ..	3	0¾	English beans	4	1¼
Palm nut cake	3	1	Linseed	4	3½
Brewers' grains (dried)..	3	1	Linseed oil	4	3½
Wheat sharps	3	2½	Egyptian cotton cake ..	4	3¾
English linseed cake ..	3	4	Maize meal	4	4
Cotton seed	3	6	English feeding barley ..	4	5½
Wheat bran	3	7½	English dun peas ..	5	0
Maize germ meal ..	3	9¼	English oats	5	2¾
Wheat bran (broad) ..	3	11½	English maple peas ..	5	5¾

TABLE V.

BRISTOL. PRICES PER FOOD UNIT.

	s.	d		s.	d.
Maize gluten feed ..	3	0½	Maize germ meal ..	3	11¼
Wheat sharps	3	5	Argentine maize.. ..	4	2½
Wheat bran	3	5¾	Linseed	4	6¾
Wheat bran (broad) ..	3	7	English oats	5	8½

TABLE VI.

AVERAGE PRICES PER FOOD UNIT.

LONDON, LIVERPOOL, HULL AND BRISTOL.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	3	Maize germ meal ..	3	10¼
Ground nut cake ..	2	5¾	Malt culms	3	10½
Wheat pollards	3	0¾	Argentine maize.. ..	3	11½
Maize gluten feed ..	3	1½	English beans	4	0
Wheat middlings (coarse)	3	1½	English feeding barley ..	4	2¾
Coconut cake	3	2½	Maize meal	4	4
Palm nut cake	3	4	Linseed	4	6
Decorticated cotton cake	3	4¼	English dun peas ..	4	6¾
American maize.. ..	3	4½	Egyptian cotton cake ..	4	7
Wheat sharps	3	4¾	Linseed oil	4	8¾
Indian linseed cake ..	3	5½	English maple peas ..	5	0¼
Distillers' grains (English)	3	5½	Bombay cotton cake ..	5	0½
Distillers' grains (French)	3	5½	Chinese beans	5	1
Wheat bran	3	5¾	English oats	5	5½
English linseed cake ..	3	6	Karachi white peas ..	5	8½
Cotton seed	3	6	Cotton seed oil	5	10
American linseed cake ..	3	6¼	Argentine oats	6	4
Brewers' grains (dried) ..	3	7¾	Feeding treacle	6	7¾
Wheat bran (broad) ..	3	8½			

TABLE VII.

GLASGOW. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	2½	Wheat bran	4	0
Wheat sharps	3	5¼	Wheat bran (broad) ..	4	0
Indian linseed cake ..	3	6½	Malt culms	4	3½
Wheat middlings ..	3	6½	Egyptian cotton cake ..	4	7¼
English linseed cake ..	3	8	Bean meal	4	11¼
Palm kernel cake ..	3	8¼			

TABLE VIII.

LEITH. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	2½	Wheat bran (broad) ..	3	9
Distillery mixed grains	3	0¾	Linseed	4	3
Wheat middlings ..	3	2½	Malt culms	4	5¼
Wheat sharps	3	2½	Egyptian cotton cake ..	4	6¼
Palm kernel cake ..	3	5¾	Maize	4	6¾
Indian linseed cake ..	3	6½	Maize meal	5	1
English linseed cake ..	3	7	Oats	5	2¾
Wheat bran	3	7¼	Feeding treacle	7	8

TABLE IX.

AVERAGE PRICES PER FOOD UNIT.

GLASGOW AND LEITH.

	s.	d.		s.	d.
Fish meal	2	2½	Linseed	4	3
Distillery mixed grains	3	0¾	Malt culms	4	4¼
Wheat sharps	3	3¾	Egyptian cotton cake ..	4	6¾
Wheat middlings ..	3	4½	Maize	4	6¾
Indian linseed cake ..	3	6½	Bean meal	4	11¼
Palm kernel cake ..	3	7	Maize meal	5	1
English linseed cake ..	3	7½	Oats	5	2¾
Wheat bran	3	9½	Feeding treacle	7	8
Wheat bran (broad) ..	3	10½			

Complete sets of figures, like the above, are not available for cattle feeding on grass, but Mr. C. B. Fisher has recorded that the daily rate of increase in live weight for the second two months' grazing is only half what it is for the first two months.

This accords quite well with the Norfolk figures, and leaves little room for doubt that cattle on grass make only small increases after three months' grazing. Taking the Norfolk figures and assuming a fixed price of, say, 9*s.* per stone live weight, then a store would give financial returns per week as below :—

			s.	d.
1st month, gaining	1¼	stone live weight per week ..	11	3
2nd " "	1¼	" " " ..	11	3
3rd " "	1¼	" " " ..	11	3
4th " "	½	" " " ..	4	6
5th " "	¼	" " " ..	2	3
6th " "	¼	" " " ..	1	1½

In such circumstances it would pay best to sell for slaughter after 12 weeks, or at the very latest 16 weeks feeding, so as to put another animal on the grass which might give a return of 9*s.* per week, especially if helped with a little cake.

TABLE X.

(1) Name of Feeding Stuff.	(2) Nutritive Ratio.	(3) Per cent. digestible. Protein.	(4) Per cent. digestible. Fat.	(5) Per cent. digestible. Carbo-hydrates and Fibre.	(6) Starch equiv. per 100 lb.	(7) Linseed Cake equiv. per 100 lb.
Foods rich in both Protein and Oil or Fat.						
Ground nut cake	1 : 0·8	45·2	6·3	21·1	77·5	102
Soya bean cake	1 : 1·1	34·0	6·5	21·0	66·7	88
Decort. cotton cake ..	1 : 1·2	34·0	8·5	20·0	71·0	93
Linseed cake, Indian ..	1 : 1·9	27·8	9·3	30·1	77·1	101
Linseed cake, English ..	1 : 2·0	26·7	9·3	30·1	76·0	100
Cotton cake, Egyptian ..	1 : 2·1	15·5	5·3	20·0	40·0	53
Cotton cake, Bombay ..	1 : 2·5	13·1	4·4	21·5	37·6	49
Distillers' grains (English) .. / Distillers' grains (French) ..	1 : 2·9	18·7	10·2	29·0	57·3	75
Maize gluten feed	1 : 3·0	20·4	8·8	48·4	87·4	115
Brewers' grains, dried ..	1 : 3·5	14·1	6·6	32·7	50·3	66
Coconut cake	1 : 3·8	16·3	8·2	41·4	76·5	101
Palm kernel cake	1 : 4·3	14·1	6·1	48·9	76·7	101
Linseed	1 : 5·9	18·1	34·7	20·1	119·2	157
Bombay cotton seed ..	1 : 6·6	11·0	16·8	30·1	77·5	102
Fairly rich in Protein, Rich in Oil.						
Maize germ meal	1 : 8·5	9·0	6·2	61·2	81·0	107
Rice meal	1 : 9·4	6·8	10·2	38·2	68·4	90
Rich in Protein, Poor in Oil.						
Fish meal	1 : 0·1	54·0	4·0	—	60·0	78
Peas, Calcutta white ..	1 : 2·1	23·3	1·1	45·9	66·9	88
Beans, English	1 : 2·6	19·3	1·2	48·2	67·0	88
Beans, Chinese	1 : 2·6	19·6	1·7	47·9	67·0	88
Peas, English maple ..	1 : 3·1	17·0	1·0	50·0	70·0	92
Palm-nut meal (extracted)	1 : 3·4	15·6	1·9	48·7	66·1	87
Brewers' grains wet ..	1 : 3·5	3·5	1·5	8·6	12·7	17
Malt culms	1 : 3·6	11·4	1·1	38·6	38·7	51
Cereals, Rich in Starch, not Rich in Protein or Oil.						
Barley, feeding	1 : 8·0	8·0	2·1	57·8	67·9	89
Oats, English	1 : 8·0	7·2	4·0	47·4	59·7	79
Oats, Argentine	1 : 8·0	7·2	4·0	47·4	59·7	79
Maize, American	1 : 11·5	6·7	4·5	65·8	81·0	107
Maize, Argentine	1 : 11·3	6·8	4·5	65·8	83·5	110
Maize meal	1 : 13·0	5·5	3·5	63·9	77·8	102
Wheat middlings, fine ..	1 : 4·8	13·2	3·0	53·8	72·0	95
Wheat middlings, coarse or sharps	1 : 5·1	13·8	4·3	50·5	64·0	84
Wheat pollards	1 : 4·5	11·6	4·0	51·6	60·0	79
Wheat bran	1 : 4·7	11·3	3·0	45·0	49·7	65
Wheat bran, broad	1 : 4·7	11·3	3·0	45·4	48·1	63
Locust bean meal	1 : 22·1	4·0	0·7	69·2	71·4	94

Sheep.—Sheep should be managed on the same general principles as cattle, for the fixing of prices is likely to apply to mutton as well as beef. Consequently, it will not pay to make prime fat sheep, for they will fetch no more per cwt. live weight than animals which are only just fit to kill.

Pigs should be kept wherever possible on the outdoor system so that their food consists principally of green stuff with a small allowance of some kind of dry food fairly rich in protein, such as palm kernel or coconut cake or meal, or maize gluten feed. Full directions for this method of feeding are given in Technical Bulletin No. 9, Series C, issued by the Food Production Department, 72, Victoria Street, London, S.W. 1.

Action of the Beckenham Urban District Council under the Cultivation of Lands Order.

As soon as the Cultivation of Lands Order was issued by the Board of Agriculture and Fisheries on 12th December, 1916, the powers it conferred on the Beckenham Local Authority were delegated to the Allotment Managers, who formed themselves into a committee and co-opted some members of the local Horticultural Society. An inspection of all the unoccupied land in the district was immediately undertaken, and a report was made by the end of the month. Though the subject was advertised in the local Press as early as 15th December, applications for allotments did not begin to come in until February, when they came in with a rush. With the least possible delay the plots were pegged out and plotted on the plans, a total number of 508 new allotments covering 33¼ acres being allocated. This new area brought the total number of allotments in the district up to 1,795, extending over an estimated total area of 120 acres.

The new land was let at 3*d.* a rod, except in one part of the district where the owners were averse to breaking up their pasture without heavy compensation. The difficulty was eventually solved by taking a field on a seven year's lease and adding it to the area under permanent allotments as distinct from the land held on temporary tenure under the Cultivation of Lands Order. This field was let at the rate of 6*d.* per rod for the first year and 1*s.* per rod for subsequent years.

Steps were also taken, with the consent of the owners, to secure the cultivation of the gardens of empty houses.

Out of 186 empty houses in the district only 7 gardens were found available, the remainder being either unsuitable for cultivation, cultivated by caretakers, or attached to houses occupied by soldiers. Regarding these 7 houses, the consent of the owner was refused in 3 cases, and given in 2 cases, while replies to applications were still being awaited in the remaining 2 cases.

Wherever the holders desired it, the Committee undertook to plough the land for them at cost price. Considerable advantage was taken of the offer and nearly 25 acres were ploughed at a cost of £34. Of the 25 acres, only 14 acres belonged to the new allotments. The Committee also undertook to obtain seed potatoes and fertilisers in bulk and retail them to the residents at cost price. The result was that over 13 tons of fertilisers and 33 tons of potatoes were supplied in 2,400 lots.

A Successful Farmers' Association.

The following Note has been communicated to the Board by the Agricultural Organisation Society :—

The West Midland Farmers' Association, Ltd., was founded in 1902 with 16 members ; it now has 691 members, and is an admirable illustration of the way in which the co-operative movement is surely, if slowly, developing in connection with British agriculture. In 1902 the sales of the Association were £536 ; in 1916, they were £103,107. In the first year of its existence the society paid 3*d.* in the £ as a bonus to members on their purchases ; last year it paid 1*s.*—the amount of the bonus distributed in 1902 was £6 ; in 1916 £3,664. Although the benefits to the associated farmers are not confined to the monetary side, a financial condition such as that of the West Midland Farmers' Association indicates the very substantial advantages to be obtained by a system of co-operative, as distinct from individual, purchase of requirements. That farmers in the district are realising the benefits of collective trading is shown by the last year's increase of membership, which was 87. The year's profit available for disposal, including just under £1,000 brought forward from last year, is £6,400 ; the net profit shows an increase of more than £2,600, "due to favourable contracts being made on rising markets." The share capital issued is less than £900, as against a general reserve of £1,200, and a special reserve of

£200 for the purpose of making up the salaries of employees on military duty. The Association, which is affiliated to the Agricultural Organisation Society, is one of the best-managed farmers' societies in the country.

THE following Note has been communicated to the Board by the Agricultural Organisation Society :—

Co-operation among Fruit Growers.

There seems a strong possibility of a wide expansion of the co-operative movement among English fruit growers. The Cheltenham and District Market Gardeners and Fruit Growers' Association, one of the pioneers in co-operative activity of this kind, has for some years past been doing excellent work in the promotion of a higher standard of technical skill by means of weekly meetings and in other ways. Latterly, the wastefulness of the system, or lack of system, by which the produce of the Association reaches the retailer has been forcibly brought home to the members. As many as a dozen carts belonging to different growers may be seen at times standing outside a single retail shop. The lack of economy that characterises this method of dealing need not be emphasised, but the shortage of man-power, horses, and so on, has made it all the more obvious. The Cheltenham Association has therefore decided to add the words "Co-operative" and "Limited" to its title, to take suitable premises, and to inaugurate its own central market where wholesaler and retailer may meet and do their business quickly and economically. They will work generally on the model of the Pershore Co-operative Fruit Market, Limited, which provides packages at a small hiring fee and insists upon honest packing and guaranteed weight, a fixed commission of $7\frac{1}{2}$ per cent. being charged on the selling price. In due course the Cheltenham Association will also purchase collectively their seeds, fertilisers, and so on, and will pulp, can, or bottle the surplus produce. The scheme is adequately financed, and looks like developing into a very important undertaking. The advantages will not be all on the side of the wholesaler, although he will be most directly affected. The consumer will benefit by the more businesslike arrangement and the consequent stabilising of prices, and an improvement in the quality and grading of home-grown fruit and vegetables. The Agricultural Organisation Society is assisting the Cheltenham Society in various ways.

OFFICIAL NOTICES AND CIRCULARS.

Agriculture and Recruiting.

THE following Memorandum, dated 5th May, 1917, has been addressed by the Director-General of the Food Production Department of the Board to the Secretaries of the Agricultural Executive Committees and to the Representatives of the Board of Agriculture and Fisheries before the Appeal and Local Tribunals:—

1. As a result of the Deputation received by the Prime Minister on 2nd April, 1917, from the Federation of War Agricultural Committees in England and Wales, and of the agreement arrived at between the Army Council and the Federation, the whole question of Agriculture and Recruiting has been under consideration by the War Office and this Department. The enclosed Army Council Instruction* has accordingly been issued, and the Instruction, in conjunction with this Memorandum, must be regarded as cancelling previous arrangements of a general character with regard to Agriculture and Recruiting.

2. With reference to the Memorandum F.P. 10 of the 28th February last, this Department are of opinion from the reports which have been received from various parts of the country that the arrangement outlined in paragraph 3 of that Memorandum is not working satisfactorily.

3. As regards men employed in agriculture passed for general service who have been refused exemption by the Tribunals, the following procedure has, therefore, been settled between the Army Council and this Department, and should be adopted.

4. Where the man in question is employed on a farm, *not being the farmer himself or the manager of the holding*, and the Agricultural Representative appointed by the Executive Committee considers that if the man is taken for military service the labour on the farm will be unduly depleted, the Representative should bring the case at once to the notice of the Executive Committee, with a view to their arranging for the provision of a substitute, either from an agricultural company, by the transfer of a farm worker classified B or C as regards military service and employed on a farm where there is excess of labour, from the National Service Volunteers, or otherwise. At the same time, the Agricultural Representative should notify the Recruiting Officer concerned, or, if he is not aware which Recruiting Officer is concerned, he should notify the Officer Commanding the Recruiting Area (hereinafter referred to as the Area Commander) of his opinion and of the action taken. The Recruiting Officer or the Area Commander will then arrange for the man's Calling-Up Notice to be suspended to enable a substitute to be provided, but if the substitute is not provided within a period of three weeks from the date of the Representative's notification the man will be called up for service with the Colours.

5. If, however, *the man in question is the farmer or is, in effect, the manager of the holding*, and is required to maintain the production of food upon it, the Agricultural Representative should at once notify the Executive Committee, who, if they are satisfied that the man's presence on the farm is indispensable, should notify the Area Commander to this effect, who, if he agrees with the opinion of the Executive Committee, will give instructions for the Calling-Up Notice to be cancelled. If, however, the Area Commander does not agree with the opinion of the Executive Committee, he is required to submit full

* Not here printed.

particulars of the case to the War Office, and in the meanwhile the Calling-Up Notice will be suspended.

6. It will be observed that as regards a man engaged whole time on a farm on farm work, for whom it is considered that a substitute is required, and it would not be reasonably possible for the Agricultural Executive Committee to provide one, an application to the Tribunal by the Military Representative for the withdrawal or variation of a certificate of exemption held by such a man will only be made after consultation with the Executive Committee or their Agricultural Representative. Similarly, application on behalf of a man for a certificate of exemption or for the renewal of a temporary certificate of exemption, will not be opposed by the Military Representative except after consultation with the Executive Committee or their Agricultural Representative.

7. The procedure outlined in the foregoing paragraphs does not throw upon the Executive Committees the duty of providing a substitute in a case in which the Tribunal decides that the man at present on the farm should be released for military service subject to a substitute being provided. They should, however, where practicable, co-operate in the provision of available substitutes.

8. The Committee's attention is specially drawn to paragraphs (4) and (5) of the Agreement embodied in paragraph 1 of the Army Council Instruction and to paragraphs 2 and 3 of the Instruction referring to those paragraphs of the Agreement.

The Army Council propose to arrange that *every Calling-up Notice* will have attached to it a form stating that if the recipient of the Calling-up Notice is an agriculturist not classified in Category A (fit for general service) whole time engaged on a farm on farm work, he should take the Notice to his employer and ask him to certify in the space provided on the form that the man is so engaged. The man should then return the form and the Calling-up Notice to the Recruiting Officer. The procedure to be followed subsequently by the Recruiting Officer and the Executive Committee is set out in paragraph 2 of the enclosed Army Council Instruction. If any case comes to the notice of the Executive Committee or the Board's Representatives in which the form above referred to was not attached to the Calling-up Notice sent out from a Recruiting Office, full particulars should be at once supplied to this Department.

9. It is desirable that the Executive Committee should make arrangements as soon as possible for the appointment of Representatives to cover the whole county to act as assistants to the Committee's Chief Representative, who is usually the Board's Representative before the Appeal Tribunal, and it is suggested that the services of the Board's Representatives before the Local Tribunals should be utilised, such Representatives to act as the local agents of the Executive Committee for the purpose of this work.

10. It would be desirable, as soon as the Executive Committee have made their arrangements with regard to the appointment of their Representatives, for the area Commander to be notified of the names and addresses of such Representatives, and of the Areas for which they act, even although the correspondence with the Area Commander will be usually conducted by the Executive Committee. At the same time this Department should be notified of the arrangements made by the Committee for dealing with this important work.

11. The above arrangements, which deal with men engaged whole time on a farm on farm work, do not embrace all men who are indispensable to the production of home-grown food. It must not, however, be assumed that men such as market gardeners, foremen in fruit or market gardens, thatchers, and men engaged with agricultural machinery, may not be equally important to the maintenance of the home-grown food supply. Although it is not possible, owing to the varying conditions of employment, for such men to be included in a general arrangement, yet this Department rely on the Tribunals giving careful and sympathetic consideration to any application for the exemption of men so employed, who are indispensable in their food-producing occupations. The Board's Representatives before the Tribunals should take care to see that the importance of such men being retained in their civil employment is clearly placed before the Tribunals.

ARTHUR LEE.

NOTE.—*Minimum Scale of Agricultural Labour usually known as the Bath Agreement.*

The following Scale has been agreed upon between the Army Council and the Board of Agriculture and Fisheries *as a general guide* for determining the number of men to be retained on farms, namely :—

One skilled able-bodied man or lad (wherever possible not of military age) for each of the following :—

each team of horses required to cultivate the land ;

every 20 cows in milk, when the assistance of women or boys is available ;

every 50 head of stall or yard stock, when auxiliary feeding is resorted to and the assistance of women or boys is available ;

every 200 sheep, exclusive of lambs, grazed on enclosed lands ;

every 800 sheep running on mountain or hill pasture.

It is obvious that this Scale cannot be undeviatingly followed, owing to the variety of methods under which agriculture is practised in different parts of the country, *nor does it embrace all descriptions of men employed on the land* ; it is circulated merely with the intention of affording guidance as to the *minimum number of certain classes of men* who are required to *preserve* the farming industry.

THE following Circular, dated 7th May, 1917, has been addressed by the Director-General of the Food Production Department of the Board to Agricultural Executive Committees :—

Harvest Labour.

SIR,—I enclose a copy of a Scheme* drawn up by the Committee appointed by the Director-General of National Service for the supply of harvest labour by Public and Secondary School masters and boys, Ministers of Religion, Civil Servants and others. Your Committee will observe that the Scheme, which has Mr. Prothero's cordial support, includes the appointment of delegates from four important organisations to meet members of the Agricultural Executive Committees and National Service Commissioners and Sub-Commissioners, and form with them Advisory Committees for the country.

* Printed below.

The Advisory Committee for your county will be summoned by the National Service Commissioner or Sub-Commissioner at an early date, and I should be glad, therefore, if your Committee will consider the Scheme without delay and appoint representatives to serve upon that Committee.

I am, etc.,

ARTHUR LEE,
Director-General.

National Service Department: Temporary Advisory Committees for Harvest.

General Explanation.—THE Director-General of National Service and the President of the Board of Agriculture have accepted the offer of the Cavendish Association to place its organisation at their disposal for the purpose of arranging harvest and other work on the land in conjunction with: The Public and Secondary Schools, Civil Servants, Clergy National Service Committee, Free Church Council, National Union of Teachers, Boy Scouts Associations, Church Lads Brigade, Cadet Corps.

A Central Harvest Committee has been formed by the National Service Department representative of these Organisations by which the general arrangements for the effectual working of the Scheme have been drawn up, and the Director-General has appointed the Cavendish Association to carry out these arrangements under the supervision of the Director of the Agricultural Section of the National Service Department.

In order to facilitate the arrangements, the Cavendish Association (representing the Public and Secondary Schools), the Bishop of the Diocese (representing the Church of England), the Free Church Federation (representing the Free Churches), and the National Union of Teachers (representing the Elementary School Teachers) are, at the invitation of the National Service Department, each appointing a delegate for each county to confer with the National Service Commissioners and Sub-Commissioners, and the Agricultural Executive Committees, as to the best means of obtaining employment for, and placing squads that will be formed in connection with, these Organisations.

The experience of the last two years has shown that this class of unskilled labour is of very real value. It is important, therefore, that the formation of squads in connection with these Organisations should be encouraged in every way possible. During the past two harvests, this type of labour has not been used to anything like the extent that it might have been, largely owing to the indefinite nature of the appeal made for it. It is difficult to get men and boys to defer their vacation arrangements until the last moment. Unless, therefore, definite demands for their assistance are put before them in good time, the services of many will be lost.

Many men connected with the Organisations referred to number amongst their friends the best type of farmers. Such men could be asked by the Advisory Committee to approach the farmers with whom they are personally acquainted; a definite demand for labour might thus be obtained at an early date, and the necessary squads arranged.

The Advisory Committee could also obtain the assistance, where it is needed, of men who are known to them in various parts of the

county who would be willing to assist in conjunction with the Agricultural Sub-Commissioner in finding accommodation suitable for squads, making arrangements for catering, for meeting squads on arrival, and generally looking after them (the latter refers especially to squads of Public and Secondary School boys).

Constitution of Advisory Committees.—It is extremely important that there should be no overlapping of effort at this critical time. The National Service Commissioner, or Sub-Commissioner, in each county, in conjunction with the Agricultural Executive Committee, will therefore form, with the four delegates of the Organisations concerned, an Advisory Committee to be convened by the National Service Commissioner, or Sub-Commissioner.

The functions of the Advisory Sub-Committee will be to consider questions as to the demand for and supply of this special class of labour, and the following are the chief points that will be referred to them.

Demand.—To impress upon farmers through the existing Sub-Committees of the Agricultural Executive Committee and Representatives appointed by the Advisory Committee, the necessity for utilising the labour provided by the National Service Department under this Scheme, and to ascertain as soon as possible, *not later than 15th June*, the labour they wish to engage. Such demands to be sent by the Agricultural Executive Sub-Committee on the forms supplied for the purpose to the Sub-Commissioner in duplicate.

Supply.—*Supply of Local Labour.*—(*a*) To receive from Public and Secondary Schools in the district particulars of squads of boys available for work *in their own localities*, either in term time or holidays, together with the names and addresses of squad managers.

(*b*) To receive from Ministers of Religion, Elementary School Masters, and Civil Servants, residing in the county, applications for work, together with the names and addresses of squad managers.

Labour from Sources Outside the County.—(*a*) To receive from the Central Committee at St. Ermin's, London, the offer of such squads as are required to supply the demands which have not been met locally, together with the names and addresses of squad managers.

(*b*) To notify the Central Committee at St. Ermin's, London, of all demands, giving full particulars of accommodation available, locality of farms, etc., on the forms supplied for that purpose. Demands will be communicated to the co-operating Organisations.

The Allocation of Labour.—(*a*) To allocate with the approval of the Sub-Commissioner the offers of service received under the heading "Supply."

(*b*) To notify the Central Committee *at once* when demands for labour notified to headquarters, are fulfilled.

N.B.—The allocation of all squads other than local squads must be arranged through the Central Committee.

Accommodation and Catering.—To consider the best means of accommodating squads and arranging for same.

(*a*) *Large Squads* in central places, to serve several neighbouring farms, going to and fro by bicycle or other means, to be billeted in schools, institutes, barns, under canvas, village inns, country houses (occupied or unoccupied).

(*b*) *Small Squads* with farmers, and, where possible, with local residents.

N.B.—The formation of squads will be in the hands of the Organisations supplying them. Full particulars as to the kind of squads for which arrangements will have to be made will be sent to the Advisory Committee at an early date.

To assist in making arrangements for catering and, where possible, obtain the help of Boy Scouts, Church Lads Brigade and Cadets. Squads will be responsible for their own catering.

Distribution.—Immediately the allocation of a squad is decided upon the farmer will be notified. The name and address of the squad manager will be sent to him in order that final arrangements may be made.

The local representative will also be informed.

Finance.—*Wages.*—To settle the question of wages with the employers in the case of each squad, subject to the general scheme laid down by the National Service Department, *i.e.* the pay of adults to be at the current rate for the job on which they are employed ; the pay of boys to be threepence or fourpence per hour. Cases of disagreement as to wages to be decided by the National Service Commissioner or Sub-Commissioner.

Clerical Expenses.—The National Service Department is prepared to reimburse the Advisory Committee for the clerical and travelling expenses necessary for the carrying out of this Scheme.

Sheep Shearers.

A MEMORANDUM, dated 14th May, 1917, issued by the Food Production Department of the Board to Agricultural Executive Committees, states that, at the request of the Board of Agriculture, the Military Authorities have instructed Commanding Officers that skilled sheep shearers not in Category "A," for whose services application is made, should be granted one month's agricultural furlough, if they can possibly be spared from their units. All applications should be forwarded through County Agricultural Executive Committees.

Organisation of Sub-Committees to the Agricultural Executive Committees.

THE following Circular Letter, dated 16th May, 1917, has been addressed by the Director-General of the Food Production Department of the Board to County Agricultural Executive Committees in England and Wales :—

SIR,—1. The programme of increasing largely the production of cereals for the harvest of 1918 will make great demands on the time and attention of the Executive Committees, and renders it necessary to develop the organisation and increase the staff of the Committees.

2. It has therefore been decided to ask Executive Committees to appoint Sub-Committees, each of which should be entrusted with a definite branch of the work, so as to relieve the Executive of the detailed work of carrying into effect the programme, leaving the Executive free to consider the more important matters of policy while exercising a general supervision of the work of the Sub-Committees. It will be necessary to retain in the hands of the Executive Committee as a whole the exercise of any of the powers conferred on it by the

Defence of the Realm Regulations, but much of the preliminary work of inquiry could be delegated to Sub-Committees.

3. Steps should be taken at once to set up the following Sub-Committees each of which might consist of not more than two members of the Executive together with other persons co-opted from outside. The chairman of the Executive and the Board's District Commissioner should be ex-officio members of all Sub-Committees.

4. *Labour Sub-Committee.*—In the first place it is essential that there should be a special Sub-Committee to deal with the all-important subject of labour. In many counties a Sub-Committee has already been appointed to deal with the distribution of soldier labour, but its functions should be extended to deal with matters relating to the supply, distribution, housing and wages of all forms of labour, including women, as well as questions affecting the retention of the existing labour on the land, the work of the Tribunals, substitution, etc. In view of the necessity of encouraging the employment of women, and particularly of those women who have been trained under the Board's scheme, the Organising Secretary of the Women's War Agricultural Committee should be co-opted as a member of the Labour Sub-Committee. It is highly important that the Labour Sub-Committee should give their active assistance to the Women's Committee, and if there is any difficulty in placing the women who are trained the Sub-Committee should use their influence with farmers to induce them to engage the women. The present and prospective shortage of man-power in all industries is so serious that dilution of labour is as essential in agriculture as in any other business, and if any farmers unreasonably decline to employ available women, the Sub-Committee might refuse to allot to them soldiers or other male labour until they agree to engage a proportion of women. The Labour Sub-Committee might deal also with the supply and distribution of Army or other horses and with any question that will arise under the Billeting of Civilians Bill. It will probably be found necessary to appoint a special officer for the work of this Committee, who should be called the Labour Officer, and who may be paid a salary not exceeding £250 a year if he gives his whole time to the work.

5. *Machinery Sub-Committee.*—A revised scheme for the operation of the Government tractors has been issued under which the Executive Committees are asked to undertake a much greater measure of responsibility for the working of the tractors than was the case under the original scheme which had to be improvised at short notice before the Executive Committees were sufficiently organised to deal with the matter. In view of the new duties entrusted to the Committees by the revised scheme, and of the volume of work involved in making arrangements for the ploughing up of the quota of grass land apportioned to each county, it will be essential to appoint a special Sub-Committee for the purpose. It should be called the Machinery Sub-Committee and should deal with the work of the tractors, the sets of steam tackle in the county, and should also be responsible for the organisation of all kinds of agricultural machinery, especially threshing machines. The Sub-Committee should consist of not more than two members of the Executive, together with the tractor representative and the steam tackle representative of the Board.

6. It will be essential that this Sub-Committee should have a special whole-time officer, who should be called the Machinery Officer. It

will be his duty, under the directions of the Sub-Committee, to inspect land in order to see that it is suitable for mechanical ploughing, to make the contracts with the farmers, to arrange with the farmers how the land should be ploughed, and to get them to mark out the fields and state the headlands required. He will also be responsible for planning the route of the tractors from field to field, so as to avoid road journeys as far as possible, and should advise the tractor representative of the Board how the tractors should get to the land to be ploughed. He should also arrange where the stores of paraffin, oil and petrol should be kept, and should supervise generally the ploughing undertaken by the tractors. It will be necessary, therefore, that this officer should be an agriculturist possessed of practical experience of mechanical cultivation. The Executive Committee should proceed at once to select this officer, and should submit his name with a statement of his qualifications to the Board for approval before he is definitely appointed. A salary not exceeding £250 a year may be offered for this post.

7. *Supplies Sub-Committee.*—The increased quantity of fertilisers, seeds and other agricultural requirements that will be needed in connection with the increase of the arable area makes it necessary that timely steps should be taken to secure their supply and distribution. A special Supplies Sub-Committee should therefore be appointed. It should consist of two members of the Executive Committee together with representatives of the principal dealers, merchants and agricultural co-operative trading societies in the county. The Sub-Committee should arrange with the traders concerned for adequate supplies of fertilisers, seeds, etc., to be available at approved prices for use when required, and should ensure that farmers, dealers and others take delivery of their probable requirements during the summer and early autumn. If orders are deferred until later in the year it may not be possible for them to be executed. The Sub-Committee should use their influence to ensure that all land in the county is adequately and properly manured, and should undertake any purchases needed for land on which the Executive Committee enter under the Cultivation of Lands Order. The Food Production Department will be prepared to give the Sub-Committee any advice and assistance in their power as to the supplies, prices, etc., of requirements. It may be necessary to appoint an officer to act as a whole-time clerk to this Sub-Committee and, if so, a salary not exceeding £3 a week may be offered for this post.

8. *Other Sub-Committees.*—Executive Committees may find it desirable to appoint other Sub-Committees to deal with such matters as finance, the survey (on which the District Valuer of the Land Valuation Department should be appointed), and other branches of the work, but it does not seem necessary at the present stage for the Department to issue any definite instructions on the subject.

9. *District Committees.*—The Board recognise that the work which will fall on the District Committees in connection with the programme for the harvest of 1918 will be very heavy, and that in some cases it may be necessary to provide for further expenditure in addition to the honoraria to the clerks which were sanctioned in the Department's Memorandum of the 26th March. The Board think that it is desirable that the engagement of clerical assistance for the District Committees should be kept under the control of the Executive Committees themselves, and those Committees are authorised to incur commitments for additional clerical assistance for District Committees up to an amount

not exceeding £200 a year in any one county without further reference to the Department. Committees should, however, bear in mind the paramount importance of strict economy, and should satisfy themselves in each case that the fullest possible use is made of the services of volunteers.

10. *General.*—In several counties the posts of Secretary and of Executive Officer of the Executive Committee are held by the same person. In view of the increasing burden of the duties entrusted to the Executive Committees the Board think that it is necessary that the offices referred to should be separated in all cases. The Secretary should be responsible for the minutes, correspondence and office work of the Committee, and the Executive Officer should be the principal technical outdoor officer of the Committee entrusted with carrying out inspections, etc., and generally supervising the cultivation of any land taken over by the Committee. It will be impossible for one man to perform effectively the duties of both posts, and Committees should therefore arrange as soon as possible to appoint a separate secretary if this has not already been done. The secretary of a Committee may be paid a salary not exceeding £250 a year if he gives his whole time to the work.

11. In some counties the post of Executive Officer is held by an officer of the County Council whose salary is less than £300 a year, which is the scale applicable in the case of Executive Officers appointed from outside. In these cases the Board will be prepared to consider proposals for some additional payment to the Executive Officer, in view of the increased burden of work placed upon him.

12. I am to add that the Board think that Executive Committees when increasing their staff should ascertain whether competent men cannot be obtained from the ranks of the Agricultural Companies. These companies often comprise a number of men who are not suited for work on the land but who have had useful clerical or business experience, and who might be of considerable assistance in the work of the Executive Committee.

I am, etc.,

ARTHUR LEE,

Director-General.

Constitution and Duties of District Sub-Committees.

THE following Circular, dated May, 1917, has been addressed by the Director-General of the Food Production Department of the Board to Agricultural Executive Committees in England and Wales :—

SIR,—The following suggestions are offered for the guidance of County Agricultural Executive Committees in constituting District Sub-Committees and in defining their duties :—

1. As a rule, it is desirable that the County Executive Committee should divide the county into convenient districts for the purpose of the increased production of food, which would in most cases correspond with the existing Rural Districts, and should appoint to each district a Sub-Committee of not less than four or more than seven members, having experience in agriculture, and willing to attend meetings regularly during the War. To each Sub-Committee should be appointed as secretary someone who will be able and willing to give a substantial

amount of time to the work of the post, and who is not already overburdened by other duties.

2. A district Sub-Committee should meet at least once a fortnight, and if possible once a week, on a different day from that on which the Rural District Council meets, so that those members who are on both bodies may be able to give their undivided attention to food production work.

3. It should keep minutes of its proceedings, and forward a report after each meeting to the County Executive Committee and to the Board of Agriculture's Commissioner for the district.

4. It should appoint one or more persons experienced in agriculture as its correspondents and representatives in each parish or convenient group of (usually not more than three) parishes in its district, and report the names of these Parish Correspondents to the County Executive Committee.

5. It should report to the County Executive Committee any land within its district which is from any cause not at present producing its full quota of food for the nation, suggest the action necessary to obtain the best possible output of food from the land, and assist the County Executive Committee in carrying out any measures which it may decide to take with that object.

6. It should report to the County Executive Committee any grass land which in its opinion ought to be ploughed up for the 1918 cropping.

7. It should report any special cases of labour shortage and should see that farmers needing labour are put in touch with any available source of supply, such as women, soldiers, etc. It should co-operate closely with other organisations for the supply of labour, such as the Women's War Agricultural Committee and the Agricultural Representative of the National Service Department.

8. It should assist farmers in obtaining, through the County Executive Committee, good seed and manures, spraying materials for potatoes, and, where necessary, the use of horses and implements.

9. It should do everything in its power to facilitate the working of any motor tractors and steam tackle available in the county, and make known to farmers the terms on which their use can be obtained.

10. It should call the attention of farmers to the facilities for obtaining credit from the banks through the County Committee under the scheme arranged by the Board.

11. It should help to organise measures for the destruction of rabbits, rats, rooks, sparrows and other pests, and use its influence with the local bodies which are authorised to spend money for this purpose.

12. It should report any difficulties in maintaining the food supply due to the land being detrimentally affected by the blocking of watercourses, or the holding-up of water by mill-dams and locks.

13. It should assist the provisions of land for allotments where needed, encourage the adoption of co-operative methods for the purchase of seed, manure, etc., and take steps to see that all existing allotments and gardens are fully cultivated.

14. It should employ its parish correspondents to obtain detailed information, and carry out measures decided upon by the County Executive Committee, and generally to keep it in close touch with individual farmers throughout its area.

15. It should keep the Board's District Commissioner and Sub-Commissioner informed of the dates of its meetings and where they are to be held, in order that they may have an opportunity of attending and advising on any question under discussion.

The County Executive Committee should keep each district Sub-Committee informed without delay of the general instructions issued by the Board, and of any action taken which affects the area under the charge of the Sub-Committee. While it must be borne in mind that the County Committee cannot delegate to a Sub-Committee the executive powers conferred on it by the Order, it should endeavour to keep each Sub-Committee fully occupied with work of a responsible character, and thus save itself from becoming overburdened by a mass of detail which can be better dealt with by men of local knowledge. The measure of success that will attend the work of the Executive Committees in stimulating the increased production of food depends very largely on the amount of work that is done by the District Committees, and unless Executive Committees can rely on obtaining effective and constant assistance from the District Committees, they cannot hope to bring home to the individual farmers of the county the urgent call for increased production, or to afford them the help that they may need in their difficulties.

I am, etc.,
ARTHUR LEE,
Director-General.

Breaking Up of Grass Land.

THE following Circular Letter, dated 2nd June, 1917, has been sent by the Food Production Department of the Board to the Chairmen of Agricultural Executive Committees :—

SIR,—With the object of securing that the policy of the Government in relation to the increase of the arable area should be carried out with the least possible friction, it is desirable to emphasise the great importance of obtaining as far as practicable the voluntary co-operation of landowners and farmers in the programme for the harvest of 1918. The Board believe that an appeal to the patriotism of all classes of agriculturists will produce such a satisfactory response that resort to the compulsory powers of the Committees will only be necessary in comparatively few instances.

It is of the utmost importance that there should be a careful selection of the grass land which should be ploughed, in order that owners and occupiers may feel confident that the requests of the Committees have been based on a careful consideration of all the facts of the case, including the vital need of maintaining the milk supply.

In order to secure this confidence the Board think it important that the composition of the Executive Committees should be fully representative of all the interests concerned. I would suggest, therefore, that your Committee should consider the advisability of asking the Board to appoint such additional members as would make it more fully representative of both the land-owning and the farming interests. The Board will be glad if you will submit the names of any additional members whom your Committee would wish to be appointed in this connection.

With regard to the arrangements which are being made for the survey of your county, it is desirable that an appeal should be made in the first instance to the landowners and farmers to meet the Committee in conference and to indicate the area of grass land which they are prepared to break up in the national interests, provided that the necessary assistance in the way of labour, horses or machinery will be supplied in due course. In several counties there have been such conferences with the agents of the principal estates who have supplied particulars of the properties under their management, and have indicated the land which might be broken up with advantage. These conferences have proved of great assistance to the work of the Committees, and it is suggested that they should be arranged in all counties.

If the total area of grassland which owners and occupiers are prepared to break up voluntarily falls far short of the quota allotted to your county, the Board think that the best course will be to engage professional surveyors, valuers, or land agents, who should be instructed to select, in co-operation with the practical farmers on the District Committees, such additional lands as, in their opinion should be ploughed up in order to complete the quota for the county.

The procedure adopted in some counties of issuing general directions that the whole or some specified proportion of the land which has been laid down since 1872 must be ploughed up is open to serious objection and is calculated to arouse opposition which should be avoided if possible. In order to meet the needs of the present emergency it may in some cases be preferable to break up land which was not arable in the seventies, and in any case indiscriminate directions which are not based on any inspection or survey of the land are likely to do more harm than good.

I am, etc.,

A. LEE,

Director-General.

THE following Notice has been issued by the Food Production Department of the Board :—

Dairy Cows and the Ploughing Up of Grass Land.

In some counties there seems to be an idea that dairy cows and other cattle can only be kept when large areas of permanent grassland are available. At a recent meeting of the Essex War Agricultural Committee, various estimates were given of the number of acres of grass land necessary for each cow when the produce of arable land was used to help with their keep. It was stated that two acres per cow were desirable. The Hon. E. G. Strutt said that he found one acre per cow quite enough. Mr. Currie, who farms for cow-keeping, thought three-quarters of an acre sufficient. These opinions of practical agriculturists show what can be done with arable land. It must not be forgotten that the total food production of arable farming may be about four times as much as that from the same area of permanent grass. By ploughing up grass, the same number of cows might be kept, and a large surplus of grain food for human consumption grown as well. Dairy farmers need not fear the new three million acres of plough land, when labour and horses and machinery are guaranteed them.

THE following Circular Letter, dated May, 1917, has been addressed by the Director-General of the Food Production Department of the Board, to County Agricultural Executive Committees :—

Breaking up Pastures for the Harvest of 1918.

Sir,—1. The Prime Minister, in his speech on Friday last, confirmed his previous statement of the Government's agricultural policy, and announced the official programme of breaking up 3,000,000 acres of grass land for the harvest of 1918. This task will have to be taken in hand at the earliest moment practicable.

2. For the last three months, strenuous efforts have been made in the face of unprecedented difficulties due to the weather and other causes, to increase production for the harvest of this year, but in the short time available it was impossible to attempt much more than to overtake the arrears of cultivation and to secure that the existing arable land should be cropped as fully as possible. Thanks to the work of the Committees, and to the increased confidence felt by farmers as a result of the guaranteed prices for cereals, the outlook for the harvest of 1917 is far more promising than appeared possible earlier in the year. In this connection the Government desires to express its appreciation of the invaluable services which have been rendered to the nation as a whole by the members and staff of Executive Committees and Sub-Committees, who have devoted so much time and labour to the task which was placed upon them.

3. It is necessary now to invite Committees to consider the measures to be taken in regard to the harvest of 1918, and they will demand far greater efforts from Committees and from farmers generally than anything attempted hitherto.

4. The Government recognises fully that the task of breaking up 3,000,000 acres of grass in England and Wales, can only be accomplished by means of a greatly increased supply of labour, of horses, and of machinery. All these matters are engaging its attention, and further communications on the subject will be sent to you as soon as possible. Consideration is also being given to the necessity of securing adequate quantities of seed.

5. In the meantime it is necessary to apportion to each county its proper share of the task. Some preliminary figures were circulated at the Conference on the 18th ultimo, which were based on the assumption that each county should plough up three-quarters of the acreage which had gone down to grass since 1872. But since then the matter has been examined further, and a revised apportionment has been prepared, a copy of which is enclosed.* In preparing this apportionment an attempt has been made to equalise so far as possible the task set to the different counties, as it is recognised that many of the grass counties could not return at once to the conditions of 1872 without sacrificing a considerable quantity of dairy stock, and also that some of the principal arable counties may reasonably be asked to plough more land than would restore the area of arable in 1872. Consideration has also been given to such factors as the number of dairy stock kept in each county in proportion to the area of permanent grass; the custom in certain counties of leaving down temporary leys for several years; the extent to which the quality of the land makes it specially

* Printed above.

suitable for producing good crops of cereals; and a general review of the local conditions of each county.

6. The apportionment suggested in the enclosed statement represents the result of all these considerations. In some counties there may be exceptional difficulties which render some reduction of the apportionment necessary. If so, the Board will be ready to consider any representations on the subject which the Committee desire to make; but it must be borne in mind that any substantial reduction of the apportionments suggested will imperil the attainment of national security, and should therefore not be proposed except for imperative reasons.

7. It will be for the Executive Committees, with the assistance of their District Committees, to apportion the increased area to be ploughed to the various district and parishes and ultimately to each individual farm. For this purpose it will be necessary to obtain particulars of the cropping, etc., of each farm, and to make a complete survey of the county in order to see that the land to be ploughed is rightly selected. It is obviously desirable to avoid as far as possible the multiplication of returns, and the Board have decided that the best course is that the annual agricultural return which is collected from each occupier on the 4th June should be made compulsory, so that the information obtained may be available for the use of the Executive Committees. The Board propose to arrange for the tabulation in parish schedules of particulars from the returns of the cropping and livestock of every holding over 20 acres in England and over 10 acres in Wales, and these schedules will be sent to the Executive Committees as they are completed. It is hoped that schedules for some of the parishes will be available by the beginning of July, and that the tabulation will be completed soon after the end of that month. By this means Committees will have a record of the cropping and stock of every farm, which should be of great assistance to them in selecting the land which should be ploughed.

8. In the meantime, Committees should concentrate on the land which ought to be ploughed during May and June. They should also do everything in their power to bring home to farmers the urgent needs of the situation, and to convince them of the necessity in the present crisis of setting aside the ordinary traditions of husbandry in order to produce the quantity of food required for national security.

9. The first task of the Committees must be to put in hand a survey of their counties in order to select, in co-operation with the farmers, the land which should be ploughed for the harvest of 1918. The survey will require careful organisation and additional professional assistance will no doubt be necessary in most cases. In view of the volume of work to be performed the Board feel that it is reasonable to provide for the payment of such surveyors or valuers as may be employed for the purpose. Executive Committees are authorised, therefore, to engage paid assistance where necessary, and the Board suggest that the remuneration of any professional surveyors or valuers employed should be at rates not exceeding £3 3s. a day, together with out-of-pocket expenses. The patriotic offers of assistance made to the Board by the Surveyors' Institution, the Land Agents' Society, the Auctioneers' Institute and the Central Association of Tennant Right Valuers lead the Board to think that professional surveyors will be prepared to accept reduced fees for work of such urgent national importance. It

will be desirable that the professional surveyors should have associated with them the best practical farmers in each district, and the co-operation of the District Sub-Committees should be invited for this purpose.

10. In selecting the land to be ploughed, Committees must constantly bear in mind that it will not be enough merely to secure that their quota of grass land is to be ploughed up. The task is to grow enough food to render ourselves independent of imported supplies, and for this purpose the land to be ploughed must be such that it will produce at least average crops of corn and potatoes. It will, therefore, not be sufficient merely to plough up the poor grass land. Such land will not produce good crops without fertilisers, and the supply of fertilisers is necessarily limited. It will, therefore, be necessary to plough up some of the good grass land. This country possesses in the good grass land the only reserve of fertility in Europe, and in the present crisis we must make use of it to produce the food which the nation needs. It will be necessary to retain sufficient grass to preserve the dairy stock, since the supply of milk must be maintained to the full; but in this connection every effort should be made to extend the system of arable dairying. With regard to other stock it will, owing to shortage of shipping, be necessary in the near future for both the Army and the civil population to obtain a much larger proportion of their meat from home sources than has hitherto been the case, and for this reason, and also in view of the shortage of feeding stuffs, a large reduction of our flocks and herds will be essential in any event.

11. The case, therefore, for a great increase of arable cultivation is overwhelming from all points of view, and Executive Committees should lose no time in bringing home to agriculturists the facts of the situation and in appealing for their whole-hearted co-operation in the national task. It is the duty of the members of the Committee themselves, and of all the leading agriculturists in the counties, to set the example in the matter. It is inevitable that there will be great difficulty in persuading many farmers to vary the system of farming to which they have been accustomed, and it is, therefore, of the first importance that the Committees should have behind them the active support of the best farming opinion in the counties. It is the earnest desire of the Government that the agricultural revolution which is necessary should be a peaceful one, and they are confident that the appeal which is made to the farmers' patriotism, backed as it is by the guarantee against loss contained in the Corn Production Bill, will not be made in vain. But it must be remembered that Committees have been invested with powers to enforce the task which is placed upon them, and in the last resort they must not hesitate to use those powers whenever necessary.

12. It is impracticable to deal in one letter with all the matters which arise in connection with the Food Production Programme for 1918, and it will be necessary to address further communications to the Committees on many points.

In the meantime it is confidently hoped that Executive Committees and all classes of the agricultural community will not fail to respond to the call which is made to them in this time of national peril, and that they will address themselves without delay to the accomplishment of their arduous task.

I am, etc.,

ARTHUR LEE,

Director-General.

ACREAGE of ARABLE LAND in each COUNTY in ENGLAND in 1872 and 1915 and the ACREAGE of GRASS LAND which should be ploughed up for the harvest of 1918.

County.	Arable Land.		Grass Land to be Ploughed.
	1872.	1915.	
	Acres.	Acres.	Acres.
Bedford	184,180	144,025	30,000
Berkshire	258,063	174,327	45,000
Buckingham	216,591	128,801	50,000
Cambridge	406,918	212,424	35,000
Isle of Ely		162,860	20,000
Chester	194,165	193,139	60,000
Cornwall	377,391	314,332	80,000
Cumberland	269,301	185,372	60,000
Derby	151,750	80,713	35,000
Devon	669,936	474,939	150,000
Dorset	239,927	158,705	55,000
Durham	214,895	139,739	45,000
Essex	640,016	507,034	85,000
Gloucester	352,095	221,540	85,000
Hampshire	536,709	357,402	90,000
Isle of Wight		27,625	10,000
Hereford	207,941	123,475	55,000
Hertford	243,969	198,959	35,000
Huntingdon	152,050	122,524	25,000
Kent	445,022	291,941	95,000
Lancaster	239,662	236,142	60,000
Leicester	181,278	96,590	60,000
Lincoln—			
Holland	1,050,602	178,477	30,000
Kesteven		266,531	50,000
Lindsey		549,103	90,000
London	—	2,213	—
Middlesex	40,011	24,065	5,000
Monmouth	91,722	32,649	30,000
Norfolk	840,148	780,687	95,000
Northampton	285,632	156,817	75,000
Soke of Peterborough ..		26,806	5,000
Northumberland	325,006	179,679	80,000
Nottingham	291,349	216,531	55,000
Oxford	277,519	198,465	65,000
Rutland	44,032	31,683	10,000
Salop	340,681	220,726	80,000
Somerset	296,868	158,218	90,000
Stafford	236,999	150,554	70,000
Suffolk East	619,028	327,392	30,000
,, West		236,784	20,000
Surrey	193,343	96,475	30,000
Sussex East	388,849	100,051	45,000
,, West		127,248	40,000
Warwick	247,936	138,625	60,000
Westmorland	54,336	35,199	15,000
Wiltshire	425,777	258,927	85,000
Worcester	214,375	121,255	40,000
York, East Riding	500,643	444,660	70,000
,, North ,, ...	418,495	319,819	80,000
,, West ,, ...	474,159	340,426	90,000
Total England ..	13,839,369	10,272,673	2,700,000

ACREAGE of ARABLE LAND in each COUNTY in WALES in 1872 and 1915 and the ACREAGE of GRASS LAND which should be ploughed up for the harvest of 1918.

County.	Arable Land.		Grass Land to be Ploughed.
	1872.	1915.	
	Acres.	Acres.	Acres.
Anglesey	76,389	57,027	18,000
Brecon	75,390	35,655	20,000
Cardigan	124,690	90,770	26,000
Carmarthen	133,597	73,884	50,000
Carnarvon	72,835	52,027	16,000
Denbigh	131,866	79,693	32,000
Flint	70,790	37,124	18,000
Glamorgan	95,575	45,728	30,000
Merioneth	37,054	27,390	12,000
Montgomery	110,811	67,115	34,000
Pembroke	122,729	89,805	30,000
Radnor	52,032	36,816	14,000
Total Wales	1,103,758	693,034	300,000
Total England and Wales	14,943,127	10,965,707	3,000,000

THE following Circular, dated 1st May, 1917, has been addressed by the Director-General of the Food Production Department of the Board to Agricultural Executive Committees in England and Wales :—

Compensation Claims.

SIR,—1. Claims for compensation of various kinds will arise in consequence of action taken by Agricultural Executive Committees in the exercise of the powers delegated to them under Regulation 2M. Such claims may for example be made when the Committee have taken possession of land under para. (1) (*a*) of that Regulation, or of machinery, plant, etc., under para. (1) (*b*), or when directions have been given to cultivate in a particular manner inconsistent with the contract of tenancy; there may be claims by the tenant for loss due to possession being taken of his land or of his stock and so on, or by the landlord for loss of rent or other matters. In short, claims of many kinds may be preferred, some of which may be admissible and others inadmissible, and it is not possible here to do more than instance subjects on which the claims received will probably be the most numerous. Arrangements have now been made with the Defence of the Realm (Losses) Commission for the procedure in dealing with these claims. It has not been found possible to obtain powers either for the Board of Agriculture or for the Agricultural Executive Committees to enter into agreements for payment where action is taken under Regulation 2M.

2. The Commission will only consider applications for compensation in respect of direct and substantial loss incurred and damage sustained by reason of interference with property or business through the exercise by the Crown of its rights and duties in Defence of the Realm, that is to say, for the present purpose, through the exercise by Agricul-

tural Executive Committees, on behalf of the Board of Agriculture, of the powers given by Regulation 2M. Such applications will only be dealt with by the Commission if made, in the first instance, to the Agricultural Executive Committee by whose action the interference has taken place, and if made on one of the forms prescribed by the Commission, a number of copies of which are sent herewith. Any person applying to the Executive Committee for compensation should be given one of these forms to fill up and return to the Committee. In the form a concise statement must be given by the applicant of the particulars and grounds of the application, setting out in the appropriate places the acts causing the alleged loss and damage and the amount and detailed items of the loss incurred and damage suffered, and of the payments applied for. In cases where stock, etc., have been taken over, it will be necessary for the applicant, in filling up the form, to furnish an inventory of the items for which he requires payment with the value stated against each item. Upon receipt of an application in this form, the Executive Committee should instruct a qualified surveyor or land-agent of local experience in whom they have confidence, to furnish them with a report, which, in addition to any general remarks, should deal specifically with each item of the claim. Where a surveyor has prepared a record of the state of any land at the time of entry by the Committee, the same individual should ordinarily be instructed to report on the application for compensation. On receipt of this report, it should be forwarded to this Department together with the original application. It will be convenient, where there are a number of items in the claim, that the report should be furnished in half-margin. The Committee, if they are unable to obtain the voluntary services of a surveyor or land-agent in any particular case, are at liberty to pay a reasonable fee for an examination of the claim and for the report.

3. On receipt of the application and report in this Department, the case will be examined by Mr. Edwin Savill, who will carry out the work of examination on behalf of the Department. The Defence of the Realm (Losses) Commission have authorised the Board of Agriculture to make a payment on account in each case, not exceeding 50 per cent., of the total sum approved by Mr. Savill after consideration of the report furnished by the local surveyor concerned.

4. The Commission have undertaken to make every endeavour to facilitate the work by disposing with all possible despatch of applications which are submitted to them in the manner above indicated. No claim can be paid in full until it has been examined and decided upon by the Commission itself. For this purpose the report of the local surveyor, together with Mr. Savill's report made after consideration thereof, will be furnished by the Board to the Commission. The Commission require the applicant to reply to any observations or objections made by this Department, or to any inquiries made by the Commission, within ten days after receipt of notice from the Commission; to attend the Commission either personally or by deputy if required by them, upon five days' notice; and to produce to the Commission upon request any book, document, register or record in his possession or power relating to the subject matter of the application. The determination of the Commission upon each application will be communicated to the applicant when it has been reported to the Treasury.

5. The above observations should be communicated to persons who apply to the Committee for compensation in order that they may be made aware of the procedure to be followed.

6. It is understood that the Commission do not object to sanctioning periodic payments to landlords or tenants in suitable cases; and this will be found useful in providing for loss of rent and so on. The making of claims by applicants, and the forwarding of them by Executive Committees according to the procedure above indicated, should not, therefore, be delayed, in any case where the Committee have taken possession of land, until their occupation has expired, but should be carried on simultaneously with the operations of the Committee in order to avoid hardship being caused to dispossessed landlords and tenants.

7. It is proposed from time to time to circulate, for the information of Committees and of surveyors or valuers employed by them, instructions for dealing with the claims to compensation in accordance with the decisions of the Defence of the Realm (Losses) Commission.

8. It should be noted that each application to the Royal Commission requires to be stamped by the applicant with the duty of 2*s.* 6*d.*, as being a statutory declaration.

I am, etc.,
ARTHUR LEE,
Director-General.

Drainage of Lands Order, 1917.

AN Order, dated 31st March, 1917, has been issued by which the Board of Agriculture and Fisheries are empowered :—

(*h*) where, in the opinion of the Board, any land is injured or is likely to be injured by any such neglect on the part of the proprietor or occupier of any other land in relation to the maintenance of banks or the cleansing of channels as is mentioned in section fourteen of the Land Drainage Act, 1847, and subject to, and after the expiration of seven days from, the service of such notice as is required by that section, to exercise such powers of executing all necessary works and recovering the expenses thereof as are by that section conferred on the proprietor or occupier of any land which is injured by any such neglect, and for any such purpose to enter on any land without any warrant or authority; and

(*i*) by notice served on the occupier or person in control of any dam, mill, lock, sluice, weir, or other obstruction of the flow of water in any river or stream, to require such occupier or person to keep open any mechanical appliance by which the flow of water is regulated during such times and in such manner as the Board, having regard to the use by such occupier or person of the obstruction and of the water thereby impounded, consider to be necessary or desirable for the prevention of floods or for the draining of land adjoining or near the river or stream.

The Order states further :—

1. The Body constituted by the Cultivation of Lands Order, 1917 (No. 3), for any county may exercise on behalf of the Board within the county any of the powers of the Board under the paragraphs (*h*) and (*i*) hereinbefore recited in the same manner as the powers which the said Body are by the said Order authorised to exercise.

2. Where any Notice is served under the powers contained in paragraph (*i*) hereinbefore recited such notice shall contain a provision to the following effect :—

> This Notice shall take effect at the expiration of seven days from the date of service hereof, unless before such expiration notice of appeal to the Board of Agriculture and Fisheries is given in writing to the Secretary to the War Agricultural Executive Committee, and in the event of any such appeal this Notice shall take effect on such date (if and) as the Board shall determine after considering the appeal.

This Order applies only to England and Wales.

THE following Circular, dated 7th April, 1917, has been issued by the Director-General of the Food Production Department of the Board to War Agricultural Executive Committees in England and Wales :

Drainage of Lands and Protection from Floods.

SIR,—1. The attention of this Department has been drawn to the difficulties which are placed in the way of maintaining the food supply of the country by the blocking of water-courses, and by the holding up of water in rivers and streams. Powers to obviate these difficulties have been obtained by an addition to Regulation 2M of the Defence of the Realm Regulations, and are delegated to County Executive Committees by the Drainage of Lands Order, 1917, a copy of which is enclosed with this letter.* The additions made to the Regulation for this purpose are set out in the Order.

Maintenance of Banks and Cleansing of Channels.—2. In many counties it has been found that the occupiers of land have neglected to maintain the banks or to cleanse the channels of drains, streams and water-courses lying in, or forming the boundaries of, the lands occupied by them ; and that for this reason the channels fail to carry off the water, and often flood the adjoining lands, thus seriously interfering with the maintenance of the food supply. A remedy exists for this state of things in the provisions of section 14 of the Land Drainage Act, 1847 ; but it is unsuited to the present emergency, and although sub-paragraph (*h*), which has been added to paragraph (1) of Regulation 2M, proceeds upon the principle of these provisions, they are considerably modified to meet the necessities of the present time. Under this paragraph of the Regulations the Executive Committee, where they find that any land is injured, or is likely to be injured, by any such neglect as has been above described, are empowered to serve a notice upon the occupier who has neglected to maintain the portion of the bank or to cleanse (by cutting the weeds or otherwise) the portion of the channel lying in, or adjoining, his land, and to call upon him to execute all necessary works for maintaining that portion of the bank, or for cleansing that portion of the channel. The occupier will be given seven days in which to execute these works or satisfy the Committee that he will promptly do so. If at the expiration of these seven days he has not done so, the Committee may enter upon his land and do the work themselves. They may afterwards recover the cost in the manner provided by Section 14 of the Land Drainage Act, 1847 ; if the neglecting occupier fails to pay the sum apportioned upon

* Printed above.

him within one month after demand, they may apply to the Justices at Petty Sessions for a summons, and the Justices, on proof of the occupier's neglect to maintain the banks or to cleanse the channels, and of the injury caused or likely to be caused to any other land by such neglect, and of the expenses incurred by the County Committee in carrying out the work, may make an order for the payment of the expenses by the neglecting occupier, or of such proportion of the expenses as the Justices think he should pay. The money ordered to be paid is recoverable under Section 6 of the Summary Jurisdiction Act, 1879.

3. In exercising the powers above described, the Executive Committee should, wherever possible, give the required notices to the neglecting occupiers upon a line of banks or a line of channels at the same time, and if, at the expiration of the seven days named in the notice, the occupiers have not taken steps to carry out the works necessary, the Committee should arrange for doing the work themselves, and should then apportion the cost according to the length of the bank lying in or adjoining the land of the particular occupier, or to the frontage of his land upon the channel cleansed, and according to the work involved in each case. It is hoped that by proceedings of this kind considerable improvements may be effected to the drainage of agricultural areas, and that substantial benefit may result to the food production of the country. In many countries the Executive Committee will probably be able to utilise the services of agricultural companies or of conscientious objectors for the purposes indicated.

4. A form of notice to occupiers is appended to this letter* ; in the schedule to the notice should be specified, (1) the land to the occupier of which the notice is addressed, and (2) the banks or channels, as the case may be, which the occupier is required to maintain or cleanse. Any notice to be served in the exercise of these powers should be signed by the Chairman of the Executive Committee and will then be received in evidence without further proof, as provided in Article 11 of the Cultivation of Lands Order, 1917 (No. 3). Para. (11), which has been added to Regulation 2M, provides for the method of service ; it is set out at the end of this letter.

5. *Obstructions of Streams and Rivers.*—It has been found in certain cases that (apart from the cleansing of the channel) the holding up of an extensive quantity of water by obstructions such as mill-dams, locks and sluices, and so on, has had an injurious effect upon the drainage of agricultural land ; and, accordingly, power has been given by sub-paragraph (*i*), which has been added to paragraph (1) of Regulation 2M, to regulate the use of these obstructions, and has been delegated to County Executive Committees by the Drainage of Land Order, 1917. This power can be exercised only where action is found to be necessary or desirable for the prevention of floods or for the draining of land in the vicinity of the river or stream, and in exercising it regard must be had to the use by the millowner or navigation trustees or other person who occupies or controls the obstruction by which the water is impounded. Executive Committees may by notice require any mechanical appliance, by which the flow of water through such an obstruction is regulated, to be kept open during such times, and in such manner as they think fit ; but in deciding upon their requirements the Committee must take care that the mill-owners or navigation

* Not here printed.

trustees or other persons in question are allowed to retain a sufficient head of water to meet the necessities of their business, and at such times as their business requires. The notice is to allow a period of seven days before the requirements are to be carried out, in order to give the person to whom the notice is addressed time to make his arrangements, and in order to give him an opportunity of appealing to the Board against the requirements. This right of appeal has been reserved on account of the considerable interests which may, in certain cases, be involved. A form of notice is appended, and the notice must specify in its schedules the obstruction, and the river or stream, to which it applies, as well as the time, extent and manner in which the mechanical appliance in question is to be kept open; it may, in some cases, be found advisable to specify the number of feet of water which may be kept at a stated point above the obstruction. Any such notice should be authenticated and served in the manner indicated in para. (4) above.

In the case of salmon waters, no notice should be served requiring measures to be taken which would constitute a contravention of Section 26 of the Salmon Fishery Act, 1861, as amended by Section 53 of the Salmon Fishery Act, 1873.

6. *Service of Notices.*—The new paragraph (11) which has been added to Regulation 2M will apply, not only to the service of notices in the exercise of the powers conferred by the new paragraphs (*h*) and (*i*), but also to any other notices served under the powers conferred by Regulation 2M. It is as follows: "Any notice under this Regulation may be served on the person to whom it is to be given, either personally or by leaving it for him at his last known place of abode, or by sending it through the post in a registered letter addressed to him there."

I am, etc.,
ARTHUR LEE,
Director-General.

The Drainage of Lands Order, 1917 (No. 2).

AN Order, dated 7th May, 1917, has been issued by which the Board of Agriculture and Fisheries are empowered :—

(*j*) where in the opinion of the Board, any land is injured or likely to be injured by flooding or inadequate drainage which might be remedied wholly or partially by the exercise of powers which are conferred by any general or local Act, or by an award made under any Act, or by any Commission of Sewers, and which are not being exercised, or in the opinion of the Board are being insufficiently exercised, to exercise any such power and also any power conferred by any such Act or award or commission for defraying the expenses so incurred or for any purpose incidental to the exercise of any such power.

The Order states further :—

1. Paragraph 1 of the Drainage of Lands Order, 1917, shall apply as if the powers of the Board under the Paragraph (*j*) hereinbefore recited, were included in the powers which by Paragraph 1 of the Drainage of Lands Order, 1917, the Body constituted by the Cultivation of Lands Order, 1917, (No. 3) for any county are authorised to exercise on behalf of the Board within the county.

2. This Order applies only to England and Wales.

THE following Circular, dated May, 1917, has been issued by the Food Production Department of the Board, to Agricultural Executive Committees in England and Wales :—

Drainage of Lands and Protection from Floods.

SIR,—1. In the Circular Letter (F. P. 25) issued by this Department on the 7th April, 1917, the attention of Agricultural Executive Committees was invited to the powers delegated to them by the Drainage of Lands Order, 1917, for securing the maintenance of banks and cleansing of channels of drains, streams and watercourses. Further powers have now been conferred upon the Board by the addition of Paragraph (1) (*j*) to Regulation 2M, and have been delegated to Agricultural Executive Committees by the Drainage of Lands Order, 1917 (No. 2),* copies of which accompany this Circular.

2. In various parts of the country it is found that powers given to Commissioners of Sewers, Drainage Boards and other bodies and persons by Commissions of Sewers, by Inclosure and Land Drainage Acts and other General or Local Acts, and by Inclosure and Drainage Awards, have either been unused, or have not been used to sufficient purpose, and that for this reason areas of land have become waterlogged or liable to floods and cannot contribute sufficiently to the food supply of the country at the present juncture. Where, therefore, in the opinion of the Agricultural Executive Committee, any land is injured or likely to be injured by flooding or inadequate drainage which might be remedied wholly or partially by the exercise of the powers already existing for such a purpose, the Committee are now enabled, in cases where they think this is necessary, to exercise these powers in the place of the body or person empowered by any such Act, Award or Commission, to take measures for the drainage of any land within the country, or for its protection from floods. Any expenses incurred in taking action under these powers, may be defrayed by the Committee in the manner indicated by the Act, Award or Commission ; where, for instance, this empowers the authority constituted under it to raise a rate on the lands benefited or to recover the expenses from the owners or occupiers of particular lands, the Committee will be able to levy such a rate, or to recover the expenses from such owners or occupiers.

3. In many cases Executive Committees will require funds with which to commence operations, even though the expenses may afterwards be recovered as indicated above. Application should, therefore, be made to this Department for an advance which will be sufficient to enable the Committee to commence any particular work, and to carry it on until they are able to levy or recover the expense incurred ; and the sums ultimately levied or recovered should be credited to the Department. In making such applications, it will not be necessary to furnish detailed estimates of the expenditure on each individual work, and in order to avoid unnecessary delay the Department are prepared to consider immediately applications for imprests for specified sums, if particulars are given of the general nature of the work for which the advance is required.

4. It is desired that the powers now delegated to Agricultural Executive Committees should be exercised mainly with a view to securing combined action by the authorities already invested with drainage powers, and not for the purpose of superseding them by a central

* Printed above.

administrative machinery, and it should generally be possible for the Committee to arrange for considerable improvement of the present position without any actual exercise of the statutory powers which the Regulation and Order enables them to exercise.

I am, etc.,
ARTHUR LEE,
Director-General.

Horses (Rationing) Order, 1917.

AN Order, dated 11th May, 1917, was issued by the Food Controller to the effect that :—

1. Except under the authority of the Food Controller no persons shall feed or permit to be fed any horse with cereal foodstuffs in contravention of this Order.

2. This Order shall not apply to horses falling within the classes mentioned in the first Schedule.

3. (*a*) Horses falling within the classes mentioned in the second and third Schedules may not on any day be fed with more than the quantity of cereal foodstuffs prescribed for such horses.

(*b*) The quantity of oats which may be fed on any one day is prescribed in the Schedules, but maize, beans or peas may be used, and if so used they shall be deemed to be the equivalent of oats in the following proportions :—

7 lb. Maize = 10 lb. oats.
9 ,, Beans = 10 ,, ,,
9 ,, Peas = 10 ,, ,,

No other cereal foodstuffs may be used, except as specified in Clause 5 of this Order.

4. Horses falling within the classes mentioned in the fourth Schedule may not be fed with any cereal foodstuffs except as specified in Clause 5 of this Order.

5. No restriction is placed by this Order on the use of hay, straw, bran or dried brewers' grains for the feeding of any horse.

6. The person or persons in possession of any horse falling within the classes mentioned on the second and third Schedules shall keep records of the oats, maize, beans and peas used for feeding such horse and such records shall at all reasonable times be open to the inspection of an officer of police or any other person authorised by the Food Controller.

7. For the purpose of this Order—

" Horse " shall include mare, gelding, colt, filly, pony and mule.

" Thoroughbred horse " shall mean a horse whose sire and dam are entered in the General Stud Book.

" Cereal foodstuffs " shall include all grains and beans and products thereof.

The Order came into force on 21st May, 1917.

The Local Government Board, by arrangement with the Food Controller, have determined that the provisions of the Local Authorities (Food Control) Order (No. 1), 1917, shall apply to the above Order of the Food Controller as if that Order were mentioned in Column 1 and the whole of that Order were mentioned in Column 2 of the Schedule to the Local Authorities (Food Control) Order (No. 1), 1917.

SCHEDULE I.

(*Horses excluded from the operation of this Order.*)

1. Horses in the possession of the Army Council or the Admiralty, or exclusively used for the purposes of the Army Council or the Admiralty.
2. Horses maintained and used exclusively for agricultural purposes.
3. Stallions used exclusively for stud purposes.
4. Thoroughbred brood mares.
5. All other brood mares in foal or with foal at foot.

SCHEDULE II.

(*Horses other than thoroughbreds to receive rations.*)

Class of Horse.	Maximum Daily Ration in Oats.	
	When in hard and continual work.	When not in hard and continual work.
Horses solely or mainly used for trade or business purposes. (See Note 1 below) :		
(*a*) Heavy dray or cart horses ..	16 lb.	12 lb.
(*b*) Trotting vanners	14 ,,	10 ,,
(*c*) Light horses and cobs ..	11 ,,	8 ,,
(*d*) Ponies 14 hands and under. (See Note 2 below.)	7 ,,	5 ,,

NOTE.—(1) The hiring out of horses is not for the purpose of this Order a trade or business purpose.

,, (2) Pit ponies may be given 2 lb. extra per day.

SCHEDULE III.

(*Thoroughbred horses to receive partial ration.*)

Class of Horse.	*Maximum Daily Ration in Oats.*
Thoroughbred horses :—	
(*a*) Weaned foals	6 lb.
(*b*) Yearlings—	
1st January to 31st May	6 ,,
1st June to 31st August	3 ,,
1st September to 31st December	6 ,,
(*c*) 2 and 3 year old fillies—	
1st January to 30th April	7 ,,
1st May to 31st October	3 ,,
1st November to 31st December	7 ,,
(*d*) Entire thoroughbreds, 2 years old and upwards not used for stud purposes	7 ,,

NOTE.—Age of a horse is to be reckoned as beginning on the 1st January of the year in which the horse was foaled.

SCHEDULE IV.

(*Horses not to receive any cereal foodstuffs.*)

(1) Racehorses and thoroughbreds, other than those specified in Schedules 1 and 3.

(2) Carriage horses, hacks, hunters, polo ponies, including all horses let out on hire for these purposes.

(3) Horses mainly used for other than business or trade purposes, including all horses let out on hire for other than these purposes.

(4) Horses not falling within any of the classes mentioned in the other Schedules to this Order.

Chopped Hay and Straw: Use of Straw.

The Army Council issued an Order, dated 9th May, 1917, to the effect that on and after 24th May, no chaffed or chopped hay shall be manufactured, purchased or delivered in Great Britain unless it contains not less than 20 per cent of chopped straw.

On and after the same date, no wheat straw shall be used for any purpose other than for feeding live stock and for thatching, and no oat straw for any purpose other than for feeding live stock, except in either case under license from the District Purchasing Officer of the district or county concerned.

Dealings in Oats (Restriction) Order, 1917.

AN Order, dated 14th May, 1917, was issued by the Food Controller to the effect that :—

1. Except under the authority of the Food Controller, no person shall either on his own behalf or on behalf of any other person

(*a*) buy, sell or deal in ; or

(*b*) offer, or invite an offer, or propose to buy, sell or deal in ; or

(*c*) enter into negotiations for the sale or purchase or other dealing in ;

any oats outside the United Kingdom, whether or not the sale, purchase or dealing is, or is to be, effected in the United Kingdom : Provided that until further notice all persons are authorised

(*a*) to ship, dispose of, and deal in oats already bought for future shipment ;

(*b*) to buy, sell or deal in oats on passage to, or arrived at, or already landed in the United Kingdom ;

(*c*) to fulfil any sales made prior to the date of this Order whether on a c.i.f. basis or on any other basis.

2. All persons concerned shall before 21st May, 1917, furnish to the Secretary of the Oats Control Committee, Grosvenor House, Upper Grosvenor Street, London, W. 1, a statement showing

(i.) stocks of their oats afloat,

(ii.) unshipped purchases of oats at the date of this Order,

(iii.) quantity sold or unsold in each case.

This Order came into force on the 15th May, 1917.

Oats Control Committee.

A COMMITTEE appointed by Lord Devonport to undertake the purchase and control of oats required from overseas for the United Kingdom and the Allies, and to take over the duties and responsibilities of the existing Allies Forage Committee, has been constituted as follows :—

Mr. S. F. Mendl (Chairman) ; The Right Hon. Thomas Wiles, M.P. ; Mr. R. H. Selbie ; Mr. E. J. Riley (War Office) ; Mr. H. Kent (Commission Internationale de Ravitaillement) ; M. Destombe (French Representative) ; Lieutenant Amadio (Italian Representative) ; M. van Rompa (Belgian Representative) ; and Mr. H. A. Francis (Secretary).

The present address of the Committee is Empire House, Kingsway, London, W.C. 2.

All persons dealing in imported oats are warned that the Oats Control Committee may call at any time for a return of all purchases and sales of such oats during a prescribed period, whether on a c.i.f. basis or on any other basis, and, that the Committee will report to the Food Controller, for such action as he may think necessary, any cases which they may find of attempts to withhold supplies from the market or to make undue profit.

AN Order, dated 9th May, 1917, was issued by the Food Controller, to the effect that :—

The Oat and Maize Products (Retail Prices) Order, 1917.

1. Except under the authority of the Food Controller no person shall on or after the 21st May, 1917, sell or buy or offer to sell or buy by retail,

(*a*) any maize flour, maize flakes, maize semolina, hominy, cerealine or maize meal at a price exceeding a price at the rate of 4*d.* per lb.

(*b*) any oatmeal, rolled oats or flaked oats or other like products of oats at a price exceeding a price at the rate of $5\frac{1}{2}d.$ per lb.

2. The maximum price shall include all charges for bags and other packages and no additional charge may be made therefor.

3. No person shall in connection with a sale or proposed sale of any article to which this Order applies enter or offer to enter into any fictitious or unreasonable transaction or make or propose to make any unreasonable charge.

4. Except in such cases as the Food Controller may otherwise determine, this Order shall apply to proprietary brands of the articles mentioned.

The Local Government Board, by arrangement with the Food Controller, have determined that the provisions of the Local Authorities (Food Control) Order (No. 1), 1917, shall apply to the above Order of the Food Controller as if that Order were mentioned in Column 1 and the whole of that Order were mentioned in Column 2 of the Schedule to the Local Authorities (Food Control) Order (No. 1), 1917.

THE Food Controller has issued an Order, dated 23rd May, 1917, to the effect that :—

Oat and Maize Products (Retail Prices) Order No. 2, 1917.

1. On and after 18th June, 1917, the maximum price mentioned in Clause 1 (*a*) of of the Oat and Maize Products (Retail Prices) Order, 1917 (hereinafter called the Principal Order), for maize flour, maize flakes, maize semolina, hominy, cerealine or maize meal shall be $3\frac{1}{2}d.$ per lb. in the United Kingdom, and the maximum price mentioned in Clause 1 (*b*) of the Principal Order for oatmeal, rolled oats, flaked oats or other like products of oats shall be $4\frac{1}{2}d.$ per lb. in Scotland and 5*d.* per lb. elsewhere in the United Kingdom, and the Principal Order shall take effect accordingly.

The Maize, Barley and Oats (Restriction) Order, 1917.

AN Order, dated 2nd May, 1917, was issued by the Food Controller to the effect that:—

1. (*a*) No person shall, after the 9th May, 1917, use or treat any maize, barley or oats or any product obtained from maize, barley or oats or any article containing maize, barley or oats or containing any such product except for the purposes permitted by this clause.

(*b*) The permitted purposes are seed, human and animal food and the manufacture of articles of food, but do not include the manufacture of glucose.

(*c*) This clause shall not apply to such products and articles as on the 9th May, 1917, are unfit to be used in human or animal food.

2. No person shall after the 9th May, 1917, use or treat any tapioca, sago, manioc or arrowroot for any purpose except for human food or in the manufacture of articles suitable for human food.

3. Any person authorised by the Food Controller may take samples of any cereal, or other article which he has reason to suspect is being used or treated or is intended to be used or treated in contravention of this Order.

Damaged Grain.

As there seems to be some misunderstanding in the trade with regard to dealings in damaged home-grown grain, it is pointed out that the charging of prices higher than those laid down in the Wheat, Barley and Oats (Prices) Order, 1917, or permitted under the general licence, coustitutes a contravention of the Order.

A dealer is entitled to charge a commission of 1*s*. per quarter over the price he is entitled to pay to the producer; but no dealer is allowed to buy from another dealer and charge more than 1*s*. per quarter over the prices laid down in the Order. This does not apply to sales of quantities of not more than five sacks, in which case the total commission may amount to 3*s*. a quarter.

Preservation of Fruit and Vegetables Without Sugar.

A Circular, dated 21st May, 1917, has been issued by the Food Production Department of the Board stating that provision has been made for courses of training in the methods of preserving fruit and vegetables. Those who satisfy the Chief Instructor as to their efficiency will be appointed as Travelling Instructors for a period not exceeding three months, and will be required to carry out their duties in any part of the country to which they are assigned, giving practical demonstrations and instructions at various centres in which engagements are made for their services.

The classes given by the Travelling Instructors will be open, without fee, to persons invited by local Food Production Societies and similar organisations and it is hoped that those attending the demonstrations will undertake voluntarily to show villagers and others how to preserve surplus fruit and vegetables.

In order to assist the Department in arranging a programme of demonstrations, the person taking charge of the local organisation of instruction classes should communicate at once with the Department

stating that the necessary local arrangements will be made. These arrangements include :—

1. The provision of suitable kitchens with range or gas-stove or boiler.
2. Utensils for fruit bottling (such as fish kettles) for boiling fruit.
3. Bottles or jam jars.

The importance of preserving surplus fruit and vegetables cannot be emphasised too strongly, and bottling on a large scale will be one of the chief means of preventing the waste of perishable fruit.

THE following Notice has been issued by the Food Production Department of the Board :—

Glass Jars for Preserving Fruit and Vegetables.

The Food Production Department has arranged with the Ministry of Munitions of War to supply glass jars for preserving fruit and vegetables. The price of the bottles is 52*s.* per gross, delivered to the nearest railway station. Orders must be for not less than 100 dozen, and preferably for 400 dozen (1 truck load). The requirements of every district must be ascertained by a responsible authority and submitted collectively. Only one order can be accepted from a locality ; the orders of private individuals cannot be accepted. The Department will shortly be in a position to meet demands to the extent of 2,000 gross jars per week. For further particulars apply to The Director-General, Food Production Department, 72, Victoria Street, London, S.W. 1.

THE Food Controller has appointed a Committee to advise the Ministry of Food on any questions which may arise in regard to the marketing and distribution of the 1917 crops of grain and potatoes. The Committee is constituted as follows :—

Marketing and Distribution of Grain and Potato Crops of 1917.

Mr. Anker Simmons (Chairman) ; Mr. J. H. Campbell, Mr. Thos. Darling, Mr. John W. Dennis, Mr. Samuel Farmer, Mr. Charles B. Fisher, Capt. R. B. Greig, Mr. Harry Hope, M.P., Mr. S. F. Mendl, Mr. Hugh Rathbone, Mr. George Walter Roffey, Mr. Wm. Soundy, Mr. Arthur C. Sadd, Mr. W. A. Smith, The Hon. E. G. Strutt, Mr. A. E. K. Wherry, and Professor T. B. Wood.

THE following Notice has been issued by the Food Production Department of the Board :—

The Spraying of Potatoes Grown by Small Cultivators in England and Wales—Arrangements for 1917.

In order to prevent the loss of potatoes from disease the Director of Horticulture (Food Production Department) has made arrangements in order to enable all allotment holders, gardeners and small cultivators generally to spray their crops. Individuals can greatly assist by joining or forming small local societies with a view to having their orders submitted in bulk by the secretary.

Knapsack Spraying Machines.—A committee of experts appointed by the Department after testing the chief types of knapsack sprayers has recommended the "Four Oaks," "Stonehouse" and "Mysto" patterns. Orders have been placed with the manufacturers for a supply of these machines. The two first types have external pumps and air chambers, and the latter an internal pump and air chamber similar to the French Vermorel type of machine. They are all made of copper, weigh when empty about 14 lb., and hold 3 to 3¼ gal. of liquid. They are suitable not only for spraying potatoes but also for keeping fruit trees clean. They may be used for practically all washes except those containing sulphur.

Knapsack spraying machines ordered from the Food Production Department may be obtained for £3, *inclusive of packing and delivery* to the nearest railway station. Instructions as to use will be sent with each machine.

To secure early delivery machines should be ordered without delay. Orders should be accompanied by cheque drawn in favour of the "Food Production Department" or "Bearer" and crossed "Bank of England." When a cheque requires to be altered from "Order" to "Bearer" the alteration should be initialled by the drawer of the cheque. In order to save labour and paper it is not proposed to acknowledge the receipt of remittances unless in any instance this is specially requested.

Materials for Spraying.—Arrangements are being made for the supply at cost price of spraying materials ready for use. Details of these arrangements will be published shortly. Copper sulphate and soda, put up in small bags and packed in wooden cases holding sufficient to spray one and one-third acres twice will cost 24*s.* a case.

Where individuals require only small bags of chemicals they should arrange with neighbours to send a combined order for not less than one case. By so doing they will save the railway companies unnecessary handling of goods.

Organisation.—For the purpose of organisation the country is being divided as far as possible into county areas for each of which an honorary organiser or supervisor will be appointed. The supervisors will assist local societies in preparing for the work of spraying. Societies are asked to help by sending in orders at once.

Instruction.—Experts will be available for the purpose of giving demonstrations in spraying. Applications for their services should be made to the Food Production Department.

Leaflet.—An illustrated leaflet on the spraying of potatoes and the organisation for 1917 has been published, and will be sent free on application to all Food Production Societies and similar organisations.

Applications should be addressed to the Food Production Department, 72, Victoria Street, London, S.W. 1, and need not be stamped.

Rabbits.

THE following Circular, dated 17th May, 1917, has been addressed by the Director-General of the Food Production Department of the Board to Agricultural Executive Committees in England and Wales :—

SIR,—1. In a Circular Letter, issued by this Department on 7th April, 1917,* Agricultural Executive Committees were invited to take all possible steps to induce landlords and shooting tenants to reduce the numbers of rabbits in order to minimise

* See *Journal*, May, 1917, p. 250.

the danger of injury to crops and pasturage. It was pointed out that powers had been conferred on the Board of Agriculture by Regulation 2R of the Defence of the Realm Regulations to take compulsory measures for this purpose, and the Agricultural Executive Committees were asked to report to this Department if they should feel that a sufficient reduction of rabbits could not be obtained by the voluntary co-operation of owners and shooting tenants.

2. While in most instances such co-operation has been freely given, Agricultural Executive Committees have been obliged in a substantial number of cases to report that no sufficient reduction can be secured without compulsory powers. It has therefore been decided by the Rabbits Order, 1917,* of which copies are sent herewith, to delegate to the Committees power to take the necessary action where they consider it desirable in order to prevent injury to crops or trees or wastage of pasturage; and to authorise farmers and other persons to enter upon land for the purpose of killing and taking rabbits.

3. In every case in which the Committee consider that action should be taken, it will be necessary for the Committee (as provided in Article 2 of the Order) to give authority in writing to a person named to enter upon the land described in the authority and to kill and take the rabbits, and to give instructions as to the disposal of the rabbits.

4. The person named may be the occupier of the land affected by the excessive number of rabbits, or any other person whom the Committee think fit to employ for the purpose. In addition to the authority above referred to, the Committee should give that occupier or other person instructions, directing him to take the action indicated in the authority.

I am, etc.,
ARTHUR LEE,
Director-General.

THE following Order, dated 12th May, 1917, has been issued by the Board of Agriculture and Fisheries :—

The Rabbits Order, 1917.

(1) The War Agricultural Executive Committee constituted under any Order made by the Board under the said Regulations † for any county are hereby authorised within the county to exercise on behalf of the Board the powers conferred by Regulation 2R so far as is necessary for the purposes of this Order.

(2) Where the Committee are satisfied that injury to crops or trees or wastage of pasturage is being caused or is likely to be caused by rabbits, and that the exercise of the powers hereby conferred is desirable, the Committee may take such action as in their opinion is necessary or expedient with a view to preventing or reducing such injury or wastage, and for such purposes may by writing authorise any person named in such authority on their behalf to enter upon any land described in any such authority for the purpose of killing and taking the rabbits upon such land, and to kill and take the rabbits, subject to such limitations as may be contained in the authority, and any rabbits killed under this provision shall be disposed of in such manner as the Committee shall authorise and direct.

* Printed below. † 2 R.

(3) Nothing herein contained shall be deemed to authorise the use of firearms for the purpose of killing rabbits between the expiration of the first hour after sunset and the commencement of the last hour before sunrise, or the use of spring traps except in rabbit holes, or the use of any poison or poisonous ingredient, or be deemed to exempt any person from the provisions of the Gun Licence Act, 1870.

(4) The powers herein before authorised to be executed by a War Agricultural Executive Committee constituted for a county may be exercised in the city and county borough of Birmingham by the War Agricultural Executive Committee constituted under the Cultivation of Lands (Birmingham) Order, 1917 (No. 2), and in any other county borough by the Council of the Borough.

(5) This Order applies to England and Wales.

THE following Notice has been issued by the Food Production Department of the Board :—

The Destruction of Wasps.

In view of the large amount of damage done to fruit by wasps, and the annoyance they cause to horses and cattle, it is necessary that steps should be taken to keep down their numbers. The capture of queen wasps in the spring is very desirable, and is encouraged in many districts by the offer of a small reward. It has also been found that traps (such as jars or bottles containing beer or sugar) which are often used later in the season against worker wasps, when used in spring, account for a large number of queens.

Nests should be marked down as soon as possible, and dealt with before they have become too strong. Various means are employed for taking nests on the ground, such as burning or smoking them with tar, paraffin or sulphur. In many districts, potassium or sodium cyanide is used most effectively. However, the supply of cyanide this year is very uncertain, whilst the price is sure to be high. Where cyanide can be obtained, its use is the best and simplest method for destroying wasps. A little cyanide is placed inside the entrance to the nest after the wasps have returned in the evening. The hole is then blocked up and further trouble is seldom experienced, although to make sure, the nest is sometimes dug out after the adult wasps have been killed. It must not be forgotten that cyanide is a deadly poison, and great care must be exercised when handling it.

THE following Circular, dated 1st June, has been addressed by the Director-General of the Food Production Department of the Board to Agricultural Executive Committees in England and Wales :—

Destruction of Pheasants.

SIR,—1. I enclose herewith copies of the Destruction of Pheasants Order, 1917 (No. 2)*, and the Pheasants (Rearing) Order, 1917,* which have been made by the Board of Agriculture and Fisheries under the powers conferred upon them by Regulation 2R of the Defence of the Realm Regulations.

2. By the Destruction of Pheasants Order, 1917, Agricultural Executive Committees were enabled, where they were satisfied that

* Not here printed.

the stock of pheasants on any land was not being so reduced as to prevent substantial injury to the crops, to authorise and direct the occupier to kill the pheasants on the land in his occupation. This power expired on 31st March, 1917. Reports have now been received from various parts of the country that pheasants are still numerous in many places and are doing damage to growing crops, and accordingly the power delegated to Agricultural Executive Committees by the earlier Order has been extended without limit of time by the Destruction of Pheasants Order, 1917, No. 2. It may be exercised in the manner indicated in the Circular A.300/C, dated the 2nd March, 1917, to which Agricultural Executive Committees are referred.

3. The limitations contained in the earlier Order as to the putting of poison on the ground and other matters are continued in the present Order.

4. Article 2 of the present Order enables persons who are entitled ordinarily to kill pheasants in the shooting season to do so at any time while the Order is in operation; and legalises the sale, purchase and possession of pheasants during the continuance of the Order.

5. By the Pheasants (Rearing) Order, 1917, the hatching and rearing of pheasants by any artificial means is prohibited except under licence issued by the Board. This prohibition applies (among other matters) to the common method of hatching pheasants by putting the eggs under a hen, to feeding the birds by hand, and so on. The power to issue licences is reserved by the Board and is not delegated to Agricultural Executive Committees.

6. The Committees may, however, where they have reason to think that the prohibition contained in the Order is not being complied with, authorise any person to enter on any land for the purpose of ascertaining whether this is being done. Any such authority should be given in writing, as it must be produced if required. If the result of an inquiry by any person so authorised is to establish that the requirements of the Order are not being complied with, the facts should be reported to this Department.

I am, etc.,
A. LEE,
Director-General.

Reduction in Acreage under Hops in England and Wales.

THE following Order in Council, dated 19th May, has been issued :—Subject to the provisions of this Regulation, the acreage cultivated with hops on any holding in England or Wales shall, before 30th June, 1917, be reduced to one-half of the acreage on the holding which was so cultivated in June, 1914, and thereafter, so long as this Regulation remains in force, the acreage on the holding so cultivated shall never exceed that proportion.

Any occupier of two or more holdings may arrange the reduction on his various holdings as he wishes, provided he effects a reduction of one-half on the whole. He must send particulars of his acreage on

each of the holdings in his occupation in 1917 and 1914 to his County War Agricultural Committee.

THE following Notice, dated June, 1917, has been issued by the Food Production Department of the Board :—

Prices of Sulphate of Ammonia.

The attention of manure mixers, agricultural merchants, co-operative societies and farmers is drawn to the advantages to be obtained from ordering sulphate of ammonia at once.

Prices have been arranged with the manufacturers for the season ending 31st May, 1918, in such a way as to give an advantage of £1 per ton to those who purchase before the end of September.

Dealers and others having good dry storage accommodation should take advantage of this offer.

1. The terms and conditions which will be applicable to the sale of sulphate of ammonia 24½ per cent. basis, in makers' single bags, net cash delivered to consumer's station in any part of the United Kingdom, in quantities of not less than two tons, are—

For orders placed with makers for delivery during the following periods :—

(*a*) *1st June*, 1917—*30th September*, 1917, £15 7*s*. 6*d*. *per ton*.

For this period orders for 60 tons and upwards are to be placed *by the 20th June* for delivery in Great Britain, and by the 10th July for delivery in Ireland. Delivery in Great Britain must be in four equal monthly quantities, and in Ireland in three equal monthly quantities. Smaller quantities must be ordered before the 15th September.

(*b*) *1st October*, 1917—*31st December*, 1917, £15 15*s*. *per ton*.

For this second period orders for 60 tons and upwards must be placed by the 10th September for delivery in three equal monthly quantities either for Great Britain or Ireland. Smaller quantities must be ordered by the 10th of each month for delivery during that month.

(*c*) *1st January*, 1918—*31st May*, 1918, £16 7*s*. 6*d*. *per ton*.

For this third period all orders, large and small, must be given by the 10th of each month for delivery during that month.

The foregoing prices are subject to a discount for cash of 10*s*. per ton to manure mixers, agricultural merchants and dealers, and co-operative societies.

2. Quantities of less than 2 tons will be supplied at the above rates, provided they form part of a bulked order of not less than 2 tons, so as to facilitate railway transport and avoid the wasteful use of trucks.

3. Where the purchaser takes delivery at the maker's works for conveyance otherwise than by rail the price will be 10*s*. per ton less. For sulphate of ammonia of a higher or lower quality a difference of 3*s*. 3*d*. per ton is to be allowed in respect of each quarter per cent.

above or below 24½ per cent. Fractional differences of less than a quarter per cent. will not be taken into account. Where makers require purchasers to provide their own bags the actual cost of bags at the time of delivery shall be allowed.

4. The net cash retail prices of sulphate of ammonia to consumers, in quantities under 2 tons, for delivery *in Great Britain* by dealers *ex* store or by makers *ex* works, shall not exceed the following :—

	Quantities of 28 lb. and less than 1 cwt.	*1 cwt. and less than 2 cwt.*	*2 cwt. and less than 1 ton.*	*1 ton and less than 2 tons.*
1st June, 1917, to 31st December, 1917..	*Per cwt.* 20*s.*	*Per cwt.* 18*s.*	*Per cwt.* 17*s.*	*Per ton.* £16 10*s.*
1st January, 1918, to 31st May, 1918 ..	21*s.*	19*s.*	18*s.*	£17 5*s.*

No additional charge to be made for excess over 24½ per cent. basis in respect of these small quantities.

Dealers and farmers, if unable to obtain supplies from local works, should apply to the Sulphate of Ammonia Distribution Committee, Food Production Department, 72, Victoria Street, London, S.W. 1.

Harvest Weather Forecasts.

THE Meteorological Office will, as in past years, but subject to certain restrictions, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of a registration fee of 1*s.* and the cost of the telegrams, computed at 9*d.* per day. The supply of forecasts will continue until 30th September. The forecasts are drawn up each week-day at 3.30 p.m., and refer to the probable weather during the 15 hours from 6.0 a.m. to 9.0 p.m. on the next day. The addition of a "further outlook" and the issue of notifications in connection with spells of settled weather are suspended during the War.

Applications for the forecasts should be sent to the Director, Meteorological Office, South Kensington, London, S.W., with a cheque or postal order payable to the Meteorological Committee, to cover the cost of the telegrams for the period, which should not be less than 6 consecutive days, during which the forecasts are to be sent.

Report for 1916 of the Animals Division of the Board.

THE Annual Report for 1916, of the proceedings of the Board, under the Diseases of Animals Acts and Fairs (Weighing of Cattle) Acts, etc., has been issued in the abbreviated form adopted last year. The two chief matters dealt with are the new procedure with regard to swine fever and the reappearance of foot-and-mouth disease in 1916. Price 3*d.*, from H.M. Stationery Office, Imperial House, Kingsway, London, W.C. ; or through any bookseller.

Produce of Crops in England and Wales in 1916.

PART II. of the Agricultural Statistics for 1916, containing returns of produce of crops in England and Wales in 1916, with summaries for the United Kingdom, has been published [Cd. 8559, price 2*d.*]. From H.M. Stationery Office, Imperial House, Kingsway, London, W.C.; or through any bookseller.

Payment of Tithe.

THE following Memorandum, dated 14th May, 1917, has been addressed by the Food Production Department of the Board to Agricultural Executive Committees :—

Where an Executive Committee have taken possession of land under the powers of Regulation 2M, they are authorised to pay the tithe rent-charge accruing due after the date of taking possession, as well as arrears for two years previous to that date, provided that proceedings for the recovery of the rent-charge are taken within two years of the due date of payment.

If the Committee make such payment of tithe, any claim made by the landlord for compensation, on account of his having been dispossessed under Regulation 2M, will be subject to reduction on account of the Committee discharging the landlord's obligations as to tithe rent-charge in the manner above indicated. It is possible that the landlord might prefer to pay the tithe rent-charge himself, even after possession has been taken by the Committee, and so be able to claim compensation without any reduction of this kind. Before the Committee pay the tithe rent-charge, current or in arrear, the landlord should be communicated with and asked to exercise his option ; if he desires that the tithe rent-charge should be paid by the Committee, the Committee may make the payment to the extent above indicated.

Tithe, Copyhold, Inclosure, Commons, and other Acts Administered by the Board of Agriculture and Fisheries.

ATTENTION is drawn to a Table of Revised Fees payable by the public, which have been prepared by the Board and approved by the Treasury, in respect of transactions under the Tithe, Copyhold, Inclosure, Commons and other Acts administered by the Board. The Final Report of the Retrenchment Committee [Cd. 8200], dated 21st February, 1916, contained a recommendation for increasing the fees taken by Public Departments and the detailed fees which were prepared in view of that recommendation, and which are now in operation, are set forth in No. 932 of the Statutory Rules and Orders, 1916, copies of which may be obtained from H.M. Stationery Office, Imperial House, Kingsway, W.C., price 1½*d.*, post free.

MISCELLANEOUS NOTES.

Notes on Crop Prospects and Live Stock Abroad.

ACCORDING to the *International Crop Report and Agricultural Statistics* for May, 1917, issued by the International Institute of Agriculture, the production of wheat in Argentina, Uruguay, Australia, and New Zealand is placed at 29,080,000 qr. in 1916–17, against 46,144,000 qr. in 1915–16, or a decrease of 37·0 per cent., and of oats at 6,521,000 qr. in 1916–17, against 10,984,000 qr. in 1915–16, or a decrease of 40·6 per cent.

Sowing of Winter Cereals in the Northern Hemisphere.—The area estimated to have been sown with winter *wheat* in 1916–17, compared with the areas sown during the corresponding period of 1915–16, expressed as percentages, are as follows: Denmark 93, Spain 105, France 85, Great Britain 92, Switzerland 104, Canada 67, United States 79, India 109, Japan 100, Algeria 96; with *rye*—Denmark 95, Spain 100, France 90, Switzerland 105, United States 121; with *barley*—Spain 93, France 110, Switzerland 99, Japan 88, Algeria 95; with *oats*—Spain 119, France 95, Great Britain 92, Switzerland 108, United States 79, Algeria 98; with *maize*—Switzerland 120.

Live Stock in France.—The numbers of farm stock on the 31st December, 1916, were as follows (the corresponding numbers on the 1st July, 1916, being shown in brackets): horses 2,245,630 (2,281,415); mules 147,630 (150,069); asses 326,570 (329,459); cattle 12,341,950 (12,723,946); sheep 10,845,280 (12,079,211); pigs 4,361,900 (4,448,366). (*International Crop Report and Agricultural Statistics*, May, 1917.)

Live Stock in New Zealand.—The numbers of live stock on the 1st January, 1916 were as follows (the numbers on the 1st April, 1911, being shown in brackets):—Horses 347,345 (404,284); cattle, including dairy cows, 2,387,036 (2,020,171); pigs 292,115 (348,754). The number of sheep on the 30th April, 1916, was 24,788,150 against 23,996,126 on the corresponding date in 1911. (*International Crop Report and Agricultural Statistics*, May, 1917.)

United States.—According to a report issued by the Statistical Bureau of the Department of Agriculture, the yield of winter wheat is estimated at 373,000,000 bush. as compared with 482,000,000 bush last year; spring wheat, 283,000,000 bush. against 158,000,000 bush.; oats, 1,381,000,000 bush. against 1,251,000,000 bush.; barley, 214,000,000 bush. against 180,000,000 bush.; and rye, 58,000,000 bush.; against 47,000,000 bush. in 1916. The area under spring wheat this year is 19,039,000 acres, as compared with 17,956,000 acres harvested last year, and oats 43,161,000 acres against 41,539,000 acres in 1916. (*Broomhall's Corn Trade News*, 9th June.)

Holland.—His Majesty's Consul-General at Rotterdam reports that, in consequence of the severe winter and unfavourable spring, garden produce under glass is on the whole about a month late, and many young plants suffered from the frost. Improvement with warmer weather, however, is anticipated. The condition of strawberries is moderate on the whole, with a few exceptions where they are good. Prospects for tomatoes are not bad, but cucumbers are disappointing. Roots, cauliflowers and lettuce are generally moderate, though good in a few districts.

France.—The area under winter wheat is officially estimated at 9,432,000 acres, and spring wheat at 958,000 acres, making a total of 10,390,000 acres as compared with 12,800,000 acres last year. The condition of winter wheat on 1st May was estimated at 52, against 8 last year, and of spring wheat 57 against 72 on 1st May, 1916. (50 = passable; 60 = fairly good; 80 = good). (*Broomhall's Corn Trade News*, 6th June).

Russia.—His Majesty's Commercial Attaché at Petrograd states that, according to an official report published in the Trade Gazette of 9th May, winter grain is generally satisfactory, but the area has substan-

tially decreased. The sowing of spring grain is not yet finished, and in some districts had only just commenced by the middle of April, also on a reduced area.

Canada.—According to a report, dated 25th May, received from the High Commissioner for Canada, the acreage under wheat in Manitoba will compare favourably with that of last year, and in Saskatchewan the acreage is the same as last year. Conditions were excellent for germination.

In a later report, dated 1st June, it is stated that wheat in Manitoba is making strong and vigorous growth, and in Saskatchewan this crop is making rapid progress. In Alberta wheat is well rooted, of sturdy appearance, and making good progress.

According to a report, dated 8th June, spring sowing is practically completed in Ontario, and the young crops promise well. Autumn wheat is improving. The fruit and general agricultural production is expected to be heavy in British Columbia. The stocks of grain in farmer's hands on 31st March are estimated by the Census and Statistics Office at Ottawa as follows: wheat, 45,638,000 bush. or 21 per cent. of the total production for 1916; oats, 136,179,000 bush. (39 per cent.); barley, 10,559,000 bush. (26 per cent.); rye, 813,500 bush. (28 per cent.); flax, 1,413,000 bush. (20 per cent.); potatoes, 15,969,000 bush. (26 per cent.); and hay and clover, 4,802,000 tons (32 per cent.). The stocks of corn are smaller and of hay larger than in any year on record.

India.—According to the final official forecast, the area under wheat in 1916–17 is estimated at 33,040,000 acres, as compared with 30,255,000 acres last season, and the production at 47,413,000 qr. against 47,922,000 qr. in 1915–16. The acreage of linseed this season is estimated at 3,533,000 acres, against 3,317,000 acres, and the production at 520,000 tons, against 474,000 tons last season. (*London Grain, Seed and Oil Reporter*, 31st May.)

Agricultural Conditions in England and Wales on 1st June.

THE Crop Reporters of the Board, in reporting on agricultural conditions in England and Wales on the 1st June, state that the increased warmth and rains of the latter part of May greatly improved the prospects of all crops. Wheat has improved, but there are in nearly all parts a certain proportion of patchy fields, and, on the whole the crop can hardly be described as more than moderate. Barley and oats are germinating very satisfactorily and everywhere present a promising appearance, except winter oats, which suffered much from the great cold, and in some districts wireworms have been troublesome. The area under barley will probably prove to be about the same as last year; while that of oats is from 8 to 9 per cent. greater, the increase being most pronounced in the west. Beans are, generally speaking—although there are exceptions—a poor crop, especially the winter sown. Peas are better, though very variable in different districts, and are probably hardly up to average on the whole.

Potato planting was late, but is now generally finished; the young crops, where through the ground, are a good, even plant, and look very promising. In the case of this crop, an increase in the total area of 10 per cent. is looked for, the increase being here also chiefly in the west.

Mangold sowing is not yet everywhere completed, but the work has been done under favourable conditions, and a good seed bed was obtained. Where up, the young plants appear to have germinated evenly, and prospects are quite satisfactory. Turnip sowing is very backward, and comparatively little has been done, but the land has been got into good order for the reception of the seed.

Hops are naturally very backward, but the bine made vigorous growth, both in the eastern and western districts, during the second half of May, and the plant is strong and healthy, so that prospects are satisfactory. The area from which a crop will be taken will be about three-fifths of last year's acreage, or half the 1914 area.

The rain and warm weather of May has made a great difference to the grass, and present appearances indicate an average yield of hay, both in the case of clovers and of permanent grass. Seeds' hay is, however, less promising in the south-west, while meadow hay is not up to the average in the eastern counties. The area of seeds which it is intended to mow is about 3 per cent. less than last year, but the area of meadow hay will probably be about the same as in 1916.

There has been abundance of blossom on all fruit trees, which has generally set well, so that prospects in the case of both orchard and small fruit are for heavy crops. The poorest prospects relate to plums, and even in their case there are more than three reports of over-average promise to every one mentioning poor prospects.

Pastures have now, except in a very few districts, plenty of grass, and the condition of all live stock shows much improvement in consequence.

The great deficiency in labour has been mitigated by the employment of soldiers, but their withdrawal from many districts is now being rather seriously felt. The shortage is now most acute for hoeing crops, and in many parts fields are becoming rather foul. At the May hirings wages showed a further rise.

Agricultural Labour in England and Wales during May.

The following local summaries give further details regarding agricultural conditions in the different districts of England and Wales :—

Northumberland, Durham, Cumberland, and Westmorland.—The supply of skilled labour is very deficient, and the shortage is being more felt since some of the soldiers have been recalled. At the Whitsuntide hirings youths and men over military age were engaged at increased wages.

Lancashire and Cheshire.—The supply of labour is deficient, but the fine weather has helped matters very considerably.

Yorkshire.—The supply of labour is still deficient, as many soldiers have been recalled from the farms.

Shropshire and Stafford.—Labour is scarce, but great assistance has been rendered by soldiers.

Derby, Nottingham, Leicester, and Rutland.—Labour is very scarce, and the scarcity is likely to become serious, with the withdrawal of part of the soldier labour.

Lincoln and Norfolk.—The supply of labour is deficient, especially in Lincolnshire, where the land is foul in consequence. Wages showed a considerable increase at the May hirings.

Suffolk, Cambridge, and Huntingdon.—The supply of labour is very short, but the weather has been favourable for field work. Probably much less corn will be hoed than usual for lack of labour.

Bedford, Northampton, and Warwick.—The deficiency in the supply of labour is still felt very keenly, although to some extent this is made up for by the willing assistance given by soldiers and women. Wages, especially of skilled labour, have been increased in most districts.

Buckingham, Oxford, and Berkshire.—With the assistance of soldiers and women, the essential work has been done, but the supply of labour is very deficient.

Worcester, Hereford, and Gloucester.—The supply of labour continues to be very short.

Cornwall, Devon, and Somerset.—Labour is for the most part scarce, but great assistance has been given by the release of soldiers, and the favourable weather of the past month has enabled arrears of work to be cleared up. Wages show an upward tendency.

Dorset, Wiltshire, and Hampshire.—The supply of labour is short, but considerable assistance has been rendered by soldiers and women. A shortage for hoeing is feared.

Surrey, Kent, and Sussex.—The supply of labour is still deficient in most districts.

Essex, Hertford, and Middlesex.—Labour is very scarce. Women are largely employed in some districts, and assistance from soldiers in others, during the early part of the month, was very helpful.

North Wales.—Experienced men are scarce, and generally the supply of labour is deficient.

Mid-Wales.—The supply of labour is short, but soldiers have been of great service.

South Wales.—Labour is still deficient in most districts, but there are signs of improvement in a few localities.

Prevalence of Animal Diseases on the Continent.

THE following statement shows that according to the information in the possession of the Board on 1st June, 1917, certain diseases of animals existed in the countries specified :—

Denmark (*month of March*).—Anthrax, Foot-and-Mouth Disease, Swine Erysipelas, Swine Fever.

France (*for the period 22nd April—5th May*).—Anthrax, Blackleg, Foot-and-Mouth Disease, Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever.

Holland (*month of April*).—Anthrax, Foot-and-Mouth Disease, Foot-rot, Swine Erysipelas.

Italy (*for the period 16th—22nd April*).—Anthrax, Black-leg, Foot-and-Mouth Disease (563 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever.

Norway (*month of April*).—Swine Fever.

Russia (*month of October*).—Anthrax, Cattle-plague, Foot-and-Mouth Disease (50,680 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine Erysipelas, Swine Fever.

Sweden (*month of April*).—Anthrax, Swine Fever.

Switzerland (*for the period 7th—13th May*).—Anthrax, Blackleg, Foot-and-Mouth Disease (6 "etables" entailing 85 animals, of which 6 "etables" were declared infected during the period), Swine Fever.

No further returns have been received in respect of the following countries : Austria, Belgium, Bulgaria, Germany, Hungary, Montenegro, Rumania, Serbia, Spain.

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	MAY.		FIVE MONTHS ENDED MAY.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	38	54	268	275
Animals attacked	40	60	305	320
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	24
Glanders (including Farcy):—				
Outbreaks...	2	—	11	21
Animals attacked	2	—	21	62
Parasitic Mange:—				
Outbreaks	173	170	1,374	1,332
Animals attacked	281	279	2,824	3,103
Sheep-Scab:—				
Outbreaks	20	7	368	172
Swine Fever:—				
Outbreaks	288	524	1,128	2,047
Swine slaughtered as diseased or exposed to infection	127	1,735	471	6,426

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	MAY.		FIVE MONTHS ENDED MAY.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	—	1	2	2
Animals attacked	—	1	2	6
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—	—	1	—
Parasitic Mange:—				
Outbreaks	7	1	23	29
Sheep-Scab:—				
Outbreaks	17	12	210	212
Swine Fever:—				
Outbreaks	16	23	124	123
Swine slaughtered as diseased or exposed to infection	113	126	854	656

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES in May and April, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	MAY.		APRIL.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	17 11	16 11	17 0	16 3
Herefords	17 2	15 11	16 9	15 5
Shorthorns	17 5	16 2	16 11	15 8
Devons	17 3	15 6	17 1	15 6
Welsh Runts	—	16 4	16 11	15 0
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	16¼	14	15¼	13½
Sheep :—				
Downs	17¾	16½	15½	14¼
Longwools	16½	15¼	14¼	13¼
Cheviots	19	17½	16¾	15½
Blackfaced	18¾	17½	16¾	15¼
Welsh	17	15¾	16	14½
Cross-breds	18	16½	15¾	14¼
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	16 0	15 0	16 1	15 2
Porkers	16 5	15 6	16 8	15 10
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	42 16	34 7	41 18	33 5
,, —Calvers ...	40 16	32 16	40 1	31 15
Other Breeds—In Milk ...	39 9	31 13	43 1	31 17
,, —Calvers ...	28 0	25 10	27 10	26 0
Calves for Rearing	3 16	2 18	3 12	2 16
Store Cattle :—				
Shorthorns—Yearlings ...	16 16	15 0	16 18	14 18
,, —Two-year-olds...	27 0	22 18	26 14	22 16
,, —Three-year-olds	35 8	29 19	35 12	29 11
Herefords —Two-year-olds...	28 8	22 12	30 5	24 5
Devons— ,,	29 1	24 9	28 9	23 12
Welsh Runts— ,,	26 9	21 15	25 18	23 1
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	80 11	68 8	70 7	61 11
Store Pigs :—				
8 to 12 weeks old	35 1	26 8	36 3	28 3
12 to 16 ,, ,, ...	57 5	45 2	59 7	46 8

* Estimated carcass weight.

AVERAGE PRICES OF DEAD MEAT at certain MARKETS in ENGLAND in May, 1917.

(Compiled from Reports received from the Board's Market Reporters).

Description.	Quality.	Birmingham.	Leeds.	Liverpool.	London.	Manchester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—						
English	1st	122 0	122 0	—	124 6	124 0
	2nd	117 6	116 6	—	120 0	117 6
Cow and Bull	1st	113 0	112 6	108 6	108 0	110 0
	2nd	104 0	105 0	94 6	101 6	100 0
Irish: Port Killed	1st	121 6	—	118 0	122 6	119 6
	2nd	112 0	—	109 0	117 6	115 0
Argentine Frozen—						
Hind Quarters	1st	107 6	—	—	—	—
Fore ,, ...	1st	95 6	—	—	—	—
Argentine Chilled—						
Hind Quarters	1st	115 0	113 6	116 0	113 6	116 0
Fore ,, ...	1st	99 6	102 0	98 6	99 0	98 6
American Chilled—						
Hind Quarters	1st	—	—	—	118 6	—
Fore ,, ...	1st	—	—	—	102 6	—
VEAL :—						
British	1st	127 0	—	137 6	129 6	137 0
	2nd	117 6	112 0	108 6	111 0	102 6
Foreign...	1st	—	—	—	—	—
MUTTON :—						
Scotch	1st	—	162 6	167 0	171 6	160 6
	2nd	—	147 0	154 0	162 6	148 6
English...	1st	156 0	162 6	149 6	162 6	151 0
	2nd	145 6	147 0	126 0	153 0	138 0
Irish: Port Killed	1st	158 6	—	157 0	—	149 6
	2nd	149 6	—	143 0	—	135 6
Argentine Frozen	1st	96 6	95 6	95 0	93 6	95 0
New Zealand ,, ...	1st	86 6	—	87 0	87 6	87 0
Australian ,, ...	1st	—	—	—	87 6	—
LAMB :—						
British	1st	172 6	173 6	171 0	178 6	172 6
	2nd	162 6	160 6	155 0	168 0	162 6
New Zealand	1st	100 6	—	98 0	98 0	98 0
Australian	1st	100 6	—	—	98 0	—
Argentine	1st	106 0	105 0	104 6	102 6	104 6
PORK :—						
British	1st	135 6	130 6	115 0	128 0	114 0
	2nd	129 0	121 6	104 6	117 6	106 6
Frozen	1st	103 6	102 6	96 0	104 0	99 6

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at certain MARKETS in ENGLAND in May, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	—	—	—	—	22 9	21 9
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery—Fresh	202 0	198 0	198 0	195 0	201 0	197 0
,, Factory	188 0	184 0	183 0	178 0	189 0	182 6
Danish	—	—	209 0	206 0	207 0	203 6
French	—	—	—	—	212 6	207 0
Dutch	—	—	—	—	199 6	193 0
American	—	—	—	—	—	—
Australian	197 0	193 6	198 0	192 0	195 0	191 0
New Zealand	207 6	205 6	206 0	204 0	205 6	201 6
Argentine	—	—	198 0	194 0	192 0	188 0
CHEESE :—						
British—						
Cheddar	166 0	163 0	—	—	165 0	—
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	162 6	157 6	176 6	—
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	162 0	160 0	163 0	—	162 0	—
BACON :—						
Irish (Green)	147 0	145 0	149 6	147 0	146 0	142 0
Canadian (Green sides)	139 6	137 6	139 6	137 6	137 0	135 0
HAMS :—						
York (Dried or Smoked)	—	—	—	—	190 0	180 0
Irish (Dried or Smoked)	—	—	—	—	158 6	154 0
American (Green) (long cut)	131 0	127 6	136 0	134 0	133 6	129 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	—	—	—	—	21 10	20 2
Irish	21 4	—	21 1	20 0	21 8	20 8
Egyptian	12 10	—	13 0	12 0	15 1	14 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Arran Chief	—	—	—	—	245 0	—
Edward VII.	—	—	—	—	245 0	—
Evergood	—	—	—	—	245 0	—
HAY :—						
Clover	—	—	—	—	140 0	130 6
Meadow	—	—	—	—	140 0	130 6

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1915, 1916 and 1917.

Weeks ended (*in* 1917).	WHEAT.						BARLEY.						OATS.					
	1915.		1916.		1917.		1915.		1916.		1917.		1915.		1916.		1917.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	46	2	55	8	76	0	29	7	47	8	66	4	26	5	31	5	47	1
,, 13 ...	48	9	56	7	75	8	30	5	48	6	65	7	27	6	31	11	47	2
,, 20 ...	51	6	57	2	75	8	31	3	49	6	64	9	28	10	32	6	47	4
,, 27 ...	52	8	58	0	75	10	32	5	51	0	64	5	29	10	32	11	47	8
Feb. 3 ...	53	3	58	3	75	10	33	7	52	5	64	0	30	3	32	4	47	3
,, 10 ...	54	8	57	6	76	0	34	7	52	10	63	5	31	1	32	2	46	11
,, 17 ...	56	0	56	11	76	3	34	11	53	6	63	8	31	5	31	9	47	3
,, 24 ...	56	0	58	2	76	9	35	3	54	2	63	9	31	8	32	2	47	8
Mar. 3 ...	55	11	59	4	77	4	34	6	55	7	64	0	31	8	32	4	48	0
,, 10 ...	54	8	58	2	78	0	33	5	55	6	63	7	31	0	32	3	48	7
,, 17 ...	53	9	57	9	78	10	32	2	55	4	64	1	30	7	31	10	49	4
,, 24 ...	54	3	55	11	80	3	31	11	54	6	65	6	30	6	31	4	50	4
,, 31 ...	54	6	53	6	81	5	31	9	53	8	71	10	30	6	30	5	51	10
Apl. 7 ...	54	9	51	8	84	4	31	3	53	7	69	11	30	4	30	1	55	1
,, 14 ...	55	4	53	2	85	2	30	10	53	1	71	10	30	5	30	7	57	2
,, 21 ...	56	5	55	3	84	10	31	5	52	10	70	6	30	11	31	8	59	8
,, 28 ...	58	3	56	3	81	1	32	7	53	5	69	5	31	5	32	4	58	6
May 5 ...	60	5	55	7	77	7	33	3	53	1	64	4	32	4	32	10	54	9
,, 12 ...	61	7	55	5	78	0	34	0	53	5	64	11	32	5	33	1	55	2
,, 19 ...	62	0	55	0	77	11	34	1	52	10	64	10	32	8	33	0	55	2
,, 26 ...	61	11	54	7	78	0	34	8	52	9	64	9	32	7	33	4	54	11
June 2 ...	61	9	53	3	78	0	35	4	53	9	65	11	32	5	33	3	54	11
,, 9 ...	60	1	51	2	78	0	34	5	52	8	67	7	32	4	32	7	55	0
,, 16 ...	56	1	48	10			34	3	50	9			31	9	32	1		
,, 23 ...	52	0	47	6			34	4	49	10			31	9	31	3		
,, 30 ...	49	5	46	3			35	3	49	1			31	1	30	10		
July 7 ...	50	1	46	3			34	7	45	6			31	6	30	8		
,, 14 ...	52	7	48	11			35	8	47	5			31	6	31	6		
,, 21 ...	53	10	51	6			35	10	48	8			32	1	32	3		
,, 28 ...	55	3	53	5			36	1	47	2			31	1	32	5		
Aug. 4 ...	55	4	55	1			35	7	46	1			31	5	32	9		
,, 11 ...	55	2	56	7			37	0	46	11			31	7	31	2		
,, 18 ...	54	3	58	1			39	4	48	0			31	4	30	8		
,, 25 ...	51	11	59	0			38	3	47	1			30	0	31	6		
Sept. 1 ...	45	3	59	4			38	1	48	5			26	10	30	5		
,, 8 ...	43	0	59	3			37	11	51	7			26	8	31	1		
,, 15 ...	42	9	59	11			39	0	52	6			26	4	30	9		
,, 22 ...	43	3	59	4			39	8	53	3			26	1	30	9		
,, 29 ...	43	5	58	10			40	4	54	1			26	5	31	1		
Oct. 6 ...	44	1	59	2			41	0	54	5			26	5	30	9		
,, 13 ...	45	9	59	7			42	3	53	10			27	1	31	6		
,, 20 ...	48	2	60	9			44	0	53	8			28	1	31	11		
,, 27 ...	50	3	62	10			46	2	54	6			29	1	32	10		
Nov. 3 ...	51	6	66	7			47	3	56	2			30	4	34	0		
,, 10 ...	52	8	69	8			47	5	58	0			30	11	35	8		
,, 17 ...	53	6	70	9			47	11	59	8			31	3	37	8		
,, 24 ...	54	2	70	8			48	7	61	8			31	1	39	7		
Dec. 1 ...	53	7	71	3			48	11	63	1			30	11	41	4		
,, 8 ...	52	10	72	1			47	10	65	6			30	4	44	1		
,, 15 ...	53	11	73	2			47	5	66	5			30	6	45	10		
,, 22 ...	53	10	74	8			47	2	67	3			30	7	46	5		
,, 29 ...	54	9	75	10			47	5	67	5			30	10	47	4		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of May, 1915, 1916, and 1917.

—	WHEAT.			BARLEY.			OATS.		
	1915.	1916.	1917.	1915.	1916.	1917.	1915.	1916.	1917.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	59 10	54 9	79 3	34 0	51 2	65 10	33 3	33 9	56 0
Norwich ...	60 2	54 1	77 6	33 1	50 7	64 10	32 1	32 10	54 9
Peterborough	60 6	53 8	77 10	33 6	51 5	64 1	32 5	32 6	54 6
Lincoln ...	61 2	55 0	77 6	32 9	54 0	62 0	32 4	32 11	55 1
Doncaster ...	60 4	55 8	77 11	32 9	52 7	65 1	31 5	32 4	54 11
Salisbury ...	59 9	56 9	77 10	34 8	50 3	65 5	33 4	33 0	54 10

The Weather in England during May.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
Week ending 5th May:								
England, N.E. ...	50·9	+4·1	0·03	1	—10	1	6·9	+1
England, E.	51·8	+3·4	0·00	0	—10	0	7·7	+1·3
Midland Counties ...	52·8	+4·8	0·00	0	—12	0	7·1	+1·4
England, S.E. ...	52·8	+3·4	0·00	0	—10	0	9·6	+3·1
England, N.W. ...	51·2	+3·6	0·02	1	—15	1	8·5	+2·9
England, S.W. ...	53·2	+4·5	0·00	0	—16	0	11·2	+5·2
English Channel ...	53·6	+3·0	0·01	0	—13	1	11·8	+4·6
Week ending 12th May:								
England, N.E. ...	44·7	—3·6	0·33	9	— 2	3	6·5	+0·5
England, E.	49·3	—0·5	0·03	1	— 9	1	10·1	+3·7
Midland Counties ...	49·4	—0·1	0·66	17	+ 7	3	7·5	+1·7
England, S.E. ...	51·9	+0·9	0·07	2	— 7	1	8·7	+2·0
England, N.W. ...	48·7	—0·5	0·72	19	+ 7	4	7·5	+1·4
England, S.W. ...	51·0	+0·5	0·69	17	+ 5	3	7·7	+1·1
English Channel ...	53·6	+1·6	0·51	13	+ 5	2	5·7	—2·3
Week ending 19th May:								
England, N.E. ...	49·6	+0·3	1·01	26	+15	5	3·3	—2·8
England, E.	54·6	+3·4	0·69	18	+ 7	3	3·2	—3·4
Midland Counties ...	53·2	+1·9	0·85	22	+ 9	4	3·4	—2·6
England, S.E. ...	54·3	+2·1	0·62	16	+ 5	4	3·0	—4·1
England, N.W. ...	51·9	+1·2	0·58	15	+ 2	4	2·7	—3·9
England, S.W. ...	51·9	0·0	0·22	5	— 7	3	3·5	—3·4
English Channel ...	53·6	+0·3	0·34	9	— 1	3	5·3	—2·5
Week ending 26th May:								
England, N.E. ...	56·6	+5·9	0·12	3	— 9	2	5·3	—0.9
England, E.	58·4	+5·5	0·30	8	— 3	3	7·1	+0·3
Midland Counties ...	59·0	+6·4	0·56	14	+ 1	3	4·7	—1·1
England, S.E. ...	58·1	+4·3	0·84	21	+10	3	6·5	—0·5
England, N.W. ...	57·7	+5·7	0·44	11	0	3	3·8	—2·6
England, S.W. ...	56·4	+3·4	1·13	29	+16	4	4·4	—2·2
English Channel ...	57·3	+3·2	0·83	21	+10	4	6·5	—1·3

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REPORT OF THE EDUCATION BRANCH FOR THE YEAR 1915-16.

THIS Report deals with the work of the various Institutions and Local Authorities in England and Wales in regard to Agricultural Education during the educational year ended 30th September, 1916, as well as with the payments of grants during the financial year ended 31st March, 1916.*

The Institutions for Higher Agricultural Education with which the Board are connected and the grants paid to each during 1915–16, are shown in Table I.

The payments in the financial year 1915–16 were in respect of pre-war commitments. During the year it was decided to suspend the grants to the Harris Institute, Preston, and to the Royal Horticultural Society's School, Wisley, as a measure of war economy. The Royal Agricultural College, Cirencester, and the Agricultural College, Uckfield, Sussex, were closed in the summer of 1915 owing mainly to the serious falling off in the attendance of students

All these Institutions have suffered as a result of the War. Many members of their staffs are on military service. At the outbreak of the War many of the students joined the Army, and naturally the number of new students coming forward was much diminished. The two largest residential Institutions, at Wye and Cirencester, have suffered most severely in this respect, and, but for the fact that the former was able to undertake short courses for youths under military age it might have shared the fate of the latter. As noted in the Report for the year 1914–15 (Cd. 8066), the Board were authorised to pay emergency grants in respect of losses caused by the War to certain of the Colleges. The payments on this account are given in Table II.

* Owing to conditions due to the War this Annual Report is not being issued separately in its usual form.

TABLE I.—*Grants to Institutions for Higher Agricultural Education.*

Name of Institution and Work in respect of which a Grant was paid.	*Amount of Grant.* 1915–16. £	1914–15. £
Universities and University Colleges.		
Aberystwyth, University College of Wales :—		
Agricultural Instruction	1,000	1,200
Bangor, University College of North Wales :—		
Agricultural Instruction	1,200	1,200
Forestry ,, ...	250	250
Cambridge, University of :—		
Agricultural Instruction	1,200	1,500
Forestry ,, ...	250	250
Leeds, University of :—		
Agricultural Instruction	1,200	1,300
Manchester, Victoria University :—		
Agricultural Instruction	300	300
Newcastle-on-Tyne, Armstrong College :—		
Agricultural Instruction	950	1,200
Forestry ,, ...	250	250
Oxford, University of :—		
Agricultural Instruction	620	1,000
Forestry ,, ...	250	250
Reading, University College :—		
Agricultural Instruction	1,300	1,300
Agricultural Colleges.		
Cirencester, Royal Agricultural College :—		
Agricultural and Forestry Instruction ..	1,200	1,200
Holmes Chapel, College of Agriculture and Horticulture :—		
Agricultural Instruction	350	700
Kingston, Derby, Midland Agricultural and Dairy College :—		
Agricultural Instruction	1,000	1,000
Newport, Salop, Harper Adams Agricultural College :—		
Agricultural Instruction	1,000	1,000
Swanley Horticultural College :—		
Horticultural Instruction	500	500
Uckfield, Agricultural and Horticultural College :—		
Agricultural Instruction	500	500
Wye, South-Eastern Agricultural College :—		
Agricultural Instruction	1,300	1,300
Special Institutions.		
British Dairy Institute, Reading :—		
Dairy Instruction	400	400
Harris Institute, Preston :—		
Agricultural Instruction	400	400
Bristol University Agricultural and Horticultural Research Station	450	450
Royal Horticultural Society's School, Wisley, Surrey :—		
Horticultural Instruction	250	250
Royal Veterinary College, London :—		
Veterinary Instruction	—	1,300
	£16,120	£19,000

TABLE II.—*Emergency Grants, 1915–1916.*

Institution.	*Amount of Grant.* £
South-Eastern Agricultural College, Wye	4,500
Harper Adams Agricultural College, Newport, Salop	1,750
Royal Agricultural College, Cirencester	2,000
Oxford University : School of Forestry	150

The attendance of students at these Institutions in the educational year 1914–15 was as follows: Long Courses, 758; Short Courses, 666, as compared with 1,194 and 490, respectively, in the preceding year. The corresponding figures in 1912–13, were 1,284 and 593. As showing the effect of the War on these Institutions, at which the average age of the student before the War was higher, it may be noted that the attendance at Cambridge fell from 150 to 51, and at Wye College from 175 to 90. In some cases the difficulties have been added to by the requisition of college buildings for military purposes.

TABLE III.—*Advisory Grants, 1915–16.*

Name of Institution.	Amount of Grant Provisionally Sanctioned in respect of the Academic Year ending 30th Sept., 1915.	*Amount of Grant Paid in	
		1915–16.	1914–15.
	£	£	£
Aberystwyth, University College of Wales	735	617	492
Bangor, University College of North Wales	1,000	624	1,249
Bristol, University of	1,000	1,146	583
Cambridge, ,, ...	1,000	605	754
Leeds, ,, ...	975	832	1,190
Midland Agricultural and Dairy College	415	346	406
Newcastle-upon-Tyne, Armstrong College	1,000	600	1,000
Reading, University College ..	1,000	913	996
Wye, South-Eastern Agricultural College	1,000	1,000	1,250
Total	£8,125	£6,683	£7,920

* The amount shown is the sum which was paid in the financial year. The grants are sanctioned in respect of the academic year ending 30th September, but in order to meet the convenience of Institutions, payments on account are made from time to time, and the sum actually paid in the financial year in some instances includes amounts in respect of more than one academic year.

The new buildings at the Armstrong College, Newcastle, have been wholly utilised as a hospital since the beginning of the War, and for a time, rooms in the School of Agriculture, Cambridge, and in Wye College were occupied for military purposes. The only Institution of which the activities have not seriously diminished is the Royal Veterinary College, London.

In last year's Report mention was made of an experimental scheme for training women in milking. This was continued and

extended during the year under notice, and a large number of women were trained in the simpler farm operations. The method employed was to grant scholarships at the Colleges for short courses on the College farms.

In addition to their ordinary educational activities the principal Colleges take a part in the supply of advice on technical matters to agriculturists. In some cases members of the staff are wholly engaged in this important duty; in other cases it is combined with teaching. Special Development Grants were paid (see Table III.) to Institutions who employ special officers for the investigation of local problems.

Research Institutes.—Under a scheme approved by the Development Commissioners in 1912, the Board give grants in aid of Scientific Research to certain Institutions, each of which specialises in a specific branch of Agricultural Science. The grants paid in the year under report are given in Table IV.

The depletion of the staffs of these Institutes has also been serious and has necessitated a considerable curtailment of the work. In some cases these Institutions have been engaged on the investigation of problems arising out of the War, notably in the case of the Cambridge Institute of Animal Nutrition. The most noteworthy investigations in progress during the year were as follows :—

1. *Imperial College of Science: Plant Physiology.*—This Institute continued its investigations on the relation of the host and parasite in fungus diseases of plants, a subject which is regarded as the basis of a proper understanding of the problem of immunity to disease in plants. An important advance was made in the knowledge concerning the permeability of plant tissues, more especially in connection with the permeability of seeds, a question of considerable economic importance. The experiments on the effect of electric discharges on field crops were transferred during the year from Leeds University. The results obtained were encouraging, and further experiments on a more extensive scale are now in progress.

2. *University of Cambridge: Plant Breeding.*—In spite of the curtailment of the scientific work caused by loss of staff, work on the economic side was conducted on the usual scale. A large number of new varieties of wheat were produced, principally of spring types, the object in view being to improve the yield of wheats suitable for late sowing. A new wheat named Yeoman was distributed on a commercial scale. This

variety combines yield with "strength," and is likely to prove valuable. Progress was made in the production of improved types of oats and barley. The new barley, "Archplume," was distributed to farmers and is likely to do well.

3. *The Rothamsted Experimental Station: Plant Nutrition and Soil Problems.*—Two-thirds of the staff are either in the Army or have left to take up special work in the Ministry of Munitions. The remainder have been largely engaged in the investigation of special problems arising out of the War. The experiments on the losses of nitrogen occurring in manure-heaps were continued and led to one highly significant discovery, namely, that in certain cases the decomposition of horse manure and of straw is accompanied by the fixation of nitrogen. The studies in soil fertility which have yielded such noteworthy results in past years were continued, with the result that further evidence regarding the importance of soil protozoa in relation to this problem was obtained.

4. *University of Cambridge: Animal Nutrition.*—This laboratory has been of great assistance to the Board in preparing monthly notes on feeding stuffs for publication in the Board's Journal. The continual fluctuations in the prices of feeding stuffs and the appearance of new cakes and meals on the market are a source of perplexity to agriculturists. These notes provide material for solving these difficulties as they arise. Members of the staff were engaged also in investigating the feeding value of British straws. The staff has been seriously depleted and there has been great difficulty in keeping pace with the problems which have arisen.

Special Research Grants.—The Research Institutes are permanently organised for the purposes of research and the substantial grants which the Board make provide the whole or the larger portion of the cost of maintenance. With a view to encouraging research at other institutions a sum of £3,000 per annum has been placed at the disposal of the Board by the Development Commissioners for the financing of investigations of specific problems. These grants are not ordinarily available for providing the salaries of investigators and are intended to provide for special and incidental expenses, and they are allocated on the advice of the Advisory Committee on Agricultural Science. The sum disbursed on this account in 1915–16 was £2,304, as compared with £3,262 in the preceding year.

Research Scholarships.—These scholarships are given with the object of encouraging promising graduates to take up

research on the agricultural sciences. Nearly all the scholars have joined the Army and no new appointments have been made since the outbreak of war. The expenditure under this head in the year under report was £1,796.

TABLE IV.—*Grants to Research Institutes.*

Subject of Research and Name of Institution to which the Grant was Paid.	Amount of Grant Provisionally Sanctioned in respect of the Academic Year ending the 30th Sept., 1915.	*Amount of Grant Paid in	
		1915–16.	1914–15.
Research Institutes.	£	£	£
Plant Physiology—Imperial College of Science and Technology	1,709	1,401	1,580
Plant Pathology—Royal Botanic Gardens, Kew	—	3,243	951
Plant Breeding—University of Cambridge	1,733	1,250	2,006
Fruit Growing — University of Bristol	2,500	2,785†	2,310
Plant Nutrition and Soil Problems—Rothamsted Experimental Station	2,850	2,450	2,675
Animal Nutrition—University of Cambridge	2,500	1,778	2,221
Animal Pathology—Royal Veterinary College	2,000	1,196	1,855
Animal Pathology—Board's Veterinary Laboratory	—	896	1,413
Dairying—University College, Reading	2,000	1,812	2,532
Zoology (Helminthology)—University of Birmingham	1,200	889	802
Zoology (Economic Entomology)—Manchester, Victoria University	600	559	400
Agricultural Economics—University of Oxford	1,000	1,000	1,015
Other Research Centres ;			
Fruit Growing — South-Eastern Agricultural College, Wye (Malling Fruit Research Station) ..	500	625‡	700
Animal Nutrition—University of Leeds	1,000	1,200‖	1,100
Poultry and Rabbit Breeding—Cambridge University	400	122	—
Glasshouse Crops—Waltham Cross Experimental Station	600	750	—
Total		£21,956	£21,560

* See foot-note to Table III.

† In addition, a grant of £450 in respect of the Bristol University Research Station is included in the Statement of Higher Agricultural Education Grants.

‡ Includes special grant of £100 in respect of the deficit on the working of the Station in 1914–15.

‖ Includes £100 capital grant in respect of building Digestibility Laboratory,

Miscellaneous Grants.—The expenditure under this head during the year under report was £3,467, under the following (principal) heads :—

Chicken Rearing, etc., Demonstrations.

	£
Morden Hall, Cambridge	262
Investigation of Bee Disease	248
Vegetable Drying and Fruit Preserving	650
Swine Fever Research	1,104
Egg Incubating Stations	225
Training of Women	794

Of these, the first three were described in last year's Report. The sum expended on Swine Fever Research represents the preliminary expenditure in connection with a scheme of research initiated by the Royal Society, but subsequently suspended owing to difficulties arising out of the War.

The expenditure on the last two, the Incubating Stations and the Training of Women, represents the cost of two special war schemes, the first of which was instituted with a view to adding to egg production by distributing improved breeds of poultry; and the second relates to the special scholarship scheme noticed above under the heading of the Agricultural Colleges.

Rural Agricultural Education.—The expenditure on Agricultural Education by the County Education Authorities comes under this head. In nearly all the counties of England and Wales a staff of teachers is engaged in the provision of lectures and advice on agricultural subjects for adults, and many counties also provide classes in technical subjects for non-adults. The head of the county staff is known as the Agricultural Organiser, but there are at present 18 counties without an officer of this description, and there can be no doubt that satisfactory progress cannot be secured unless the work is co-ordinated and directed by a special officer.

The State grants which are available in aid of local expenditures on Agricultural Education are two-fold, (1) "Parliamentary Grants," and (2) Development (Farm Institute) Grants. The Residue Grants are also technically available for this purpose. In the year under report the expenditure under this head was £27,908, of which £12,820 was debitable to the Development Fund.

Early in the year the Board issued a circular urging the importance of confining expenditure on Agricultural Education

in the counties within the strictest limits compatible with the maintenance of necessary work, and in response to this appeal, expenditure on demonstrations and experiments, instruction in manual processes and other less urgent operations were in many cases suspended or curtailed.

A suggestion made in the same circular that the making of cheese instead of butter should be encouraged, from the view both of the conservation of the food supply and the economical utilisation of surplus milk, was later developed in the Board's scheme for the establishment of Travelling Cheese-Schools, under which sets of apparatus were purchased by the Board for loan to local authorities who agreed to make new or additional provision for itinerary instruction on this subject. Nineteen authorities availed themselves of this offer, and 33 new schools were set up under the scheme, in addition to five previously in existence; while in several other counties dairying instructresses, previously employed mainly in teaching butter-making, devoted their attention to cheese instead. On the whole, this scheme has been taken up with much enthusiasm and has met with very encouraging success. An extended report on this scheme has appeared in this *Journal*.*

Another important phase of local educational activities during the year was the organisation of instruction for women in milking and the lighter branches of farm work. The scholarships offered by the Board for the training of women at Institutions have already been alluded to; but the increasing withdrawal of male labour from the land, and the inability of many women to avail themselves of institutional courses, made it necessary to supplement these facilities. Private farmers were enlisted in many cases for this purpose, and much has been done in this way to overcome the prevalent conservatism in regard to the employment of women labour in the fields.

On the other hand, there was a considerable falling-off in the number of organised courses of instruction—a fact which was, however, partly compensated for by a general demand for special lectures dealing more directly with problems of cultivation arising out of war conditions. As a rule, the Agricultural Organiser, where he existed, was employed as Secretary to the County War Agricultural Committee, and it was generally found possible to combine with advantage his activities in this capacity with his ordinary educational and advisory functions. Other members of the county staffs joined the Army in large numbers, so that a good deal of

* See November, 1916, p. 767, and December, 1916, p. 897.

extra work was thrown on the depleted staffs remaining, in spite of the reduction of portions of the regular work already noted.

As pointed out in the Report for 1914–15, schemes for building farm institutes in certain counties are held in abeyance until after the War. During 1916, however, the extension of the Cumberland and Westmorland Farm School at Newton Rigg was completed, while the new buildings of the Midland Agricultural College at Sutton Bonington were practically finished. Of the £25,000 from the Development Fund sanctioned in respect of the latter scheme, £15,000 came from the Farm Institute Fund.

Particulars furnished by the local authorities* show that 292 organised day courses were held in the year ended 31st July, 1916, as against 341 in the previous year, while the attendance of students numbered 2,963 as compared with 3,544. The greater part of these courses were attended by women and were held in connection with Travelling Dairy Schools. Courses of instruction in farriery for soldiers were held in several counties.

Under the head of Evening Schools and Classes, 171 courses, attended by 3,227 pupils, were held, the corresponding figures for the previous year being 297 and 4,975. Lectures of a popular nature were given in nearly all the counties, the number reported to the Board being 4,511 as against 6,387 in 1914–15. Instruction by means of classes in Manual Processes (hedging, ploughing, milking, etc.) was given in twelve counties, the total number of meetings being 644; in the previous year, 2,071 meetings were held in 21 counties. The returns from eight Institutions providing residential courses of the Farm Institute type show that instruction was provided for 469 pupils. The attendance at six such Institutions in 1914–15 was 332.

Summary of Grants.—The total amount distributed by the Board in the form of grants for agricultural education and research in the financial year 1915–16 was £98,646. During the last five years the figures were as follows :—

	£		£
1911–12	28,690	1914–15	96,628
1912–13	32,434	1915–16	98,646
1913–14	67,939		

The grant paid in 1915-16 included a sum of £66,415 from the Development Fund, the corresponding sum in the preceding year being £62,917.

* Except Montgomeryshire.

The purposes to which the grants of 1915–16 and the corresponding grants of 1914–15 have been applied were :—

	1915–16. £	*1914–15.* £
Educational Grants to Universities and Colleges	16,120	19,000
Grants for Advisory Work	6,683	7,920
Grants to Research Institutes and other Research Centres	21,956	21,560
Grants for Special Research and other Investigations (including Miscellaneous Development Schemes and Emergency Experiments)	6,371	6,295
Research Scholarships (including Expenses of Selection)	1,796	4,825
Grants for Farm Schools, Technical Classes, Local Lectures, etc.	27,908	23,681
Capital Grants-in-Aid of the Establishment of Farm Schools	13,594	7,300
Grants towards the Expenses of Advisory Councils	1,160	1,946
Grants for Forestry Advice, Research and Experiments	3,058	4,101
	£98,646	£96,628

CIDER FRUIT FOR TABLE USE.

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THE need of raising the production of home-grown food to the highest degree possible under existing conditions is now recognised. While every effort is required to obtain the maximum yield of the staple foods of the country, any produce of potential food value deserves attention. Among such material which is normally not taken into account for feeding purposes the cider fruit crop deserves consideration.

Hitherto cider apples as a class have been regarded as suitable only for making cider ; but the pressed pomace, or residue of the pulp left after the juice has been extracted for cider-making, has been used more or less generally on the farms in the cider districts as a food for cattle. This substance was dealt with recently in an article in this *Journal** and need not, therefore, be considered here.

* Vol. XXII., p. 851.

The question as to whether or not the best use is being made of cider apples in the present emergency by converting them into cider is in many respects analogous to that of barley and beer. It may be pointed out that serious injury to the cider industry need not be apprehended if a portion of the cider fruit crop is diverted to other uses. The consumption of cider is likely to be affected by the imposition of a duty on that beverage. Although just now the restrictions on beer have caused an increased demand for cider, the provision of other uses for cider apples should not only do no harm to the cider industry, but tend to avoid waste of fruit and loss to the grower.

The difficulty of finding any satisfactory alternative outlet for cider fruit is due to the nature of the article itself. Broadly speaking it is unpalatable to eat in the raw state partly on account of the leathery texture of the flesh and partly because of its more or less astringent bitter flavour and frequent lack of acidity. Most attempts to cook the apples have ended in failure, the tissues remaining tough and leathery. To a limited extent they can be used as food for stock, and it is intended shortly to deal with this side of the subject in a separate article.

Hitherto in this country the only direction in which cider apples appear to have been used to any extent other than for making cider, has been for jam-making. In seasons when the market apple crop has been deficient, jam manufacturers have bought considerable quantities of certain kinds; but they appear to limit their purchases to the sharp or acid varieties.

It may be here explained that there are three classes of cider apples, namely, the sharps or sours, the sweets and the bittersweets. These are distinguished by the chemical composition of their juice. Apple juice of the sharp class contains normally more than ·45 per cent. of malic acid; that of the sweet class less than ·45 per cent. of malic acid and less than ·2 per cent. of tannin; and that of the bittersweet class less than ·45 per cent. of malic acid and more than ·2 per cent. of tannin. Table apples, dessert or culinary, resemble the sharp class in acidity, but generally contain much less tannin. Table I. illustrates these points of difference between typical cider and table apples.

While apples generally can be separated into two main groups, *i.e.* table apples and cider apples, and the latter again fall naturally into the three classes already mentioned, the classification is a purely arbitrary one based on certain chemical

standards. There is no essential difference between a cider apple and a table apple, and cases could be instanced of recognised cider varieties which might rank as table sorts of at least average merit, and *vice versa*. The question of utilising the crop of cider fruit for human food does not appear to have been seriously considered. Probably the unpalatability of the average cider apple in the raw state and the apparent impossibility of cooking it satisfactorily have sufficed to divert attention from it. The fact, however, that jam manufacturers use the sharp varieties in years of scarcity indicates that these

TABLE I.—*Composition of Juice of Table and Cider Apples*, 1909.

Name of Variety.	Specific Gravity.	Percentage Composition of Juice.	
		Malic Acid.	Tannin.
Table varieties :—			
Bramley's Seedling	1·045	·55	·084
Cox's Orange Pippin ..	1·059	·62	·062
Lane's Prince Albert ..	1·045	·84	·092
Newton Wonder	1·044	·65	·084
Wellington	1·043	·86	·060
Worcester Pearmain ..	1·040	·30	·092
Sharp cider varieties :—			
Cap of Liberty	1·055	·92	·186
Foxwhelp	1·059	·75	·190
Frederick	1·053	·83	·076
Kingston Black	1·062	·55	·114
Sweet cider varieties :—			
Old Cadbury	1·056	·15	·172
Slack-ma-Girdle	1·050	·19	·108
Sweet Alford	1·055	·16	·120
White Jersey	1·055	·19	·044
Bittersweet cider varieties :—			
Chisel Jersey	1·060	·18	·364
Royal Jersey	1·058	·24	·440
Silver Cup	1·060	·19	·312
White Close Pippin	1·048	·18	·244

at any rate can be cooked adequately, and that the relatively high percentage of tannin which many of them possess as compared with the average table variety does not affect too seriously the flavour of the product.

That being so, it appeared worth while investigating the cause of the bad cooking qualities of the sweet and bittersweet varieties. It seemed to be tacitly assumed that the reason why

these would not cook was that the tannin caused the tissues of the pulp of the apple to become leathery and prevented them from softening properly during the cooking. On that assumption many of the sharp varieties used by the jam manufacturers should fail to cook satisfactorily; but since the latter, while refusing generally to purchase sweet and bittersweet apples, appear to be willing to take any sharp sorts, it does not seem probable that any serious difficulty is experienced in cooking any of those to a fine pulp. Moreover, many sweet varieties contain very little tannin, but nevertheless cook badly. Hence it seemed likely that the cause of the difficulty in cooking lay in another direction.

During the course of recent work at Long Ashton on the pectin compounds of apples it was found that the yield of soluble pectins from cider apple pomace was increased by treatment with a dilute solution of a suitable acid. In this case, after all water-soluble pectin bodies had been removed by repeated washing with cold and hot water, digestion of the insoluble residue with dilute sulphuric or tartaric acid resulted in a further yield of pectins in solution, accompanied by a considerable softening and disintegration of the residual pulp. This suggested the idea that the leathery character of the cooked tissues of sweet and bittersweet apples might be due to the presence of pectin compounds which remained more or less insoluble after cooking.

A trial was therefore carried out with apples of the Dabinett variety, a well-known bittersweet type, the juice of which contained approximately ·2 per cent. malic acid and ·4 per cent. tannin. These were peeled and cored and then sliced and boiled for 15 minutes in a dilute solution of tartaric acid. At the end of that time the slices had almost completely disintegrated and had boiled down to a soft pulp of nearly uniform consistency. As a control some of the fruit was boiled similarly in water; but in this case even after prolonged boiling the slices retained their original form and remained in a leathery uncooked condition. The two samples were then tasted for comparison. The difference between them was most striking. So far as the cooking was concerned, the acid-treated fruit was thoroughly satisfactory. The pulp was uniformly well-cooked and in that respect was quite up to the standard of the average kind of culinary apple. The slices boiled in water, on the other hand, were tough and leathery and completely unsatisfactory from the culinary point of view. As regards flavour, the addition of

acid gave a pleasant briskness to the taste and relieved the natural insipidity of the bittersweet character. It also to some extent masked the bitterness and astringency produced by the presence of the somewhat large amount of tannin in the variety selected for trial. The tannin character, however, remained clearly discernible, particularly to palates unaccustomed to cider and cider apples, and the addition of sugar failed to obscure it completely although of assistance in this respect. The addition of acid also appeared to intensify the "apple" flavour of the fruit, and during the course of the cooking the pleasant, fruity, apple-like aroma given off by the fruit seemed to exceed appreciably that produced during the cooking of the average table variety. Further tests were then made in a similar way with a considerable number of varieties of sweet and bittersweet apples, those of the sharp type being omitted since it was known that they would cook satisfactorily. The approximate composition of the juice of some of the varieties tested is given in Table II.

TABLE II.—*Composition of Juice of Cider Varieties Used in Cooking Trials.*

Name of Variety.	Specific Gravity.	Percentage Composition of Juice.	
		Malic Acid.	Tannin.
Broadleaf Jersey	1·059	·30	·39
Cremière	1·057	·34	·18
Dabinett	1·059	·17	·35
Dove	1·046	·11	·16
Écarlatine	1·047	·08	·12
Eggleton Styre	1·055	·20	·14
Harry Masters Jersey	1·057	·22	·42
Médaille d'Or	1·050	·22	·58
Sweet Alford	1·057	·14	·17
Yarlington Mill	1·048	·23	·30

Is was found that in no case was there any difficulty in cooking the fruit satisfactorily when a dilute solution of tartaric acid was used. The results when water alone was used were variable. Generally the slices remained leathery as described in the previous case; but in a few instances where fruit on the over-ripe side was taken the cooking was somewhat more satisfactory, and in one instance approached the standard of an average culinary variety. Probably in such cases the advanced stage of ripeness of the fruit was associated

with changes in the pectin compounds, the greater part of which by that time had been converted into water-soluble forms.

The character of the flavour in the tests where acid was used varied considerably according to the kind of apple. Speaking generally, all varieties of the sweet class, *i.e.* sorts in which the amount of tannin in the juice did not exceed ·2 per cent., gave a cooked product which did not differ materially in flavour from that of any ordinary culinary variety. In fact in most cases an uninitiated person tasting it would fail to detect that a culinary sort had not been used. With varieties of the bitter-sweet class the results differed according to the amount of tannin contained in the respective kinds. When the percentage was not much above ·2, the tannin flavour was barely noticeable, even in unsweetened samples. As it approached ·4 it became more marked, and over that quantity it was distinctly pronounced and not easy to mask by sweetening. The " apple " flavour in all cases was very well marked.

The appearance of the pulp after cooking differed according to variety. Many sorts cooked perfectly white and translucent. Others showed a yellower tint, which was, however, not sufficiently marked to detract from their appearance. So long as the cooking was carried out in the manner about to be described, the results in this respect equalled those obtained with ordinary culinary varieties. It is important, however, to follow more or less closely the method given on account of the tendency of cider apples to develop a brownish colour somewhat rapidly after they are cut owing to the oxidation of the tannin compounds. This persists and spoils the appearance after cooking unless suitable precautions are adopted.

The method of cooking used in the laboratory trials was as follows :—A glass beaker of suitable size was filled to about one-third of its capacity with a solution of tartaric acid made up at the rate of 1 oz. of the crystalline acid to a pint of water. This was kept boiling vigorously throughout the cooking trial. The apples were next dealt with, being peeled and cored and each cut into five or six pieces as quickly as possible, the sections being thrown into the boiling liquid as soon as they were prepared. The beaker was filled nearly to the brim with the sliced fruit and then covered with a glass plate to check the escape of the steam In most cases ten or fifteen minutes cooking sufficed, the fruit being by that time reduced more or less to a pulpy condition. The actual length of time required for cooking varied somewhat according to the variety of fruit used, its state of ripeness, and the thickness of

the individual slices; but even in the most refractory cases the cooking was completed in less than half-an-hour. When a stronger solution of acid was used, the requisite time of cooking was reduced, while a weaker solution necessitated generally longer cooking.

Since individual taste as regards degree of acidity varies considerably, it will doubtless be found most satisfactory to modify the strength of the acid solution according to taste; and in this connection it may be observed that the amount of sugar required subsequently for sweetening purposes is largely affected by the quantity of acid used. This again is a matter of individual taste. When the quantity of acid used is relatively small, many will probably find that no added sugar is necessary for sweetening. For bittersweet apples with a pronounced tannin flavour, the latter is best obscured by taking a rather large quantity of acid and a proportionately large amount of sugar. When sugar is required, it is essential that this should not be added until the cooking is completed, otherwise the cooking quality of the fruit is impaired. If added as soon as cooking is finished, it will readily dissolve in the hot pulp and give uniform sweetness. It is not desirable to reduce the amount of liquid used in the method mentioned above. Well-cooked pulp almost invariably absorbs the whole of it, and if less is taken there is a risk that a part of the fruit may be charred as a result of heating the cooking vessel directly over the source of heat. This can be obviated by using a double vessel, such as an ordinary porridge saucepan, for the cooking; but in this case the temperature is reduced and a longer period of cooking is required. For domestic purposes an enamelled saucepan, or an aluminium or copper one, serves admirably in the place of the glass vessels which were used in the laboratory trials. For table purposes the cooked pulp can be used alone or admixed with other fruit as ordinary stewed fruit; or it can be utilised for apple tarts, puddings, etc. In the latter case this preliminary cooking is desirable, although not absolutely necessary if a small quantity of the acid solution is used in the tart or pudding also.

The pulp is equally serviceable for jam or jelly making, either alone or in combination with other fruit; but it must be cooked as above before the addition of any sugar. When used for jam making with other fruit, if the latter is fairly acid the addition of any acid solution is unnecessary, the acidity of such fruit ensuring adequate cooking, provided that sufficient is used. Apple jelly can be very simply made by boiling the

fruit whole in the acid solution until it is thoroughly cooked and begins to split. The clear liquid is then poured off and sugar dissolved in it at the rate of 1 lb. for every pint. This is then boiled again until it is concentrated sufficiently to set on cooling.

For jam making on a commercial scale apples are now used largely, their value as a source of pectin to assist the setting of various other kinds of jam being considerable. The use of cider apples of the sharp class for this purpose has already been referred to above and is well known to the trade. Cider apples of the sweet and bittersweet classes, if treated on the lines just indicated, may now be employed to equal advantage for the same purpose, and not only the fruit itself but also the pressed pomace, *i.e.* the solid residue of pulp remaining after the juice has been extracted for cider-making. This has been done recently on a commercial scale with considerable success.

The kind of acid used in the initial experiments was tartaric, which occurs naturally in grape juice and many fruits; but any other organic acids found in fruits appear equally efficient and can be substituted, if more convenient. Of such acids citric, the natural acid of lemons, and malic, the natural acid of apples and pears, are of common occurrence; but the cost of the latter in a pure state is prohibitive. Both tartaric and citric acids, on the other hand, are still cheap enough to use in the small quantities required without adding appreciably to the cost. Where fruit or fruit juices are available these can be used with advantage in the place of the acid itself, the requisite quantity being easily ascertained by trial. Thus, orange or lemon juice answers admirably, the juice of one lemon mixed with sufficient water to furnish the required amount of liquid being adequate to cook some few pounds of apples. Again, a few cider apples of the sharp class or culinary apples, or their juice serve equally well.

The chemical action of acid on the apples during cooking has been investigated. Without going into details here, it can be stated that it consists primarily in the conversion of comparatively insoluble pectin compounds into others readily soluble in the acid liquid used. There is also a solvent action on the starch present in the tissues of the fruit.

It is evident that all cider fruit could be utilised for human consumption in case of necessity. From calculations published recently* it seems probable that the average total crop in

* This *Journal*, Vol. XXII., p. 851.

England is not less than 200,000 to 250,000 tons. The average crop in France according to recent estimates* approaches 2½ million tons. The proportion of fruit of the sharp class to that of the bittersweet and sweet classes is not high. In the West of England it is certainly well below 1 : 2, probably appreciably less than 1 : 3. In France it is undoubtedly lower still. A very considerable addition to our possible food resources is thus now available. In apples the chief constituent of direct nutritive importance is sugar, which in the case of the average cider apple is distinctly greater in quantity than in an average table apple, frequently exceeding 10 per cent. of the total weight of the fruit. The beneficial effects of this fruit in other ways on general health are recognised, and its value therefore as an article of diet is quite inadequately expressed in terms of its content of substances of ordinary nutritive significance.

The most obvious objection likely to be raised against the use of cider fruit as food is that of the small size of the individual apples. A very fair proportion of the cider fruit crop, however, could be obtained in the form of apples of a size which would compare favourably in that respect with many of the cheaper grades of culinary apples regularly placed on the market. A little care in selection at the time of gathering the fruit would furnish a large supply of medium-sized fruit. The smaller specimens could be used in jam manufacture, just as is the case now with undersized culinary apples.

Any drawback in respect of size is counterbalanced by the low market value of the fruit. In a season of scarcity such as the last cider apples were obtainable without difficulty at £3 to £4 per ton ; and in 1914 and 1915 the price was less than one-half that mentioned.

* *Le Cidre et le Poiré*, December, 1916.

THE DETERMINATION OF THE COST OF PRODUCTION OF FARM CROPS.

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Definition.—In discussing the subject of this article it is desirable in the first place to come to some understanding as to what is implied by the term "Cost of Production." Taking a general case, it will be admitted that the cost of production of any farm crop comprises at least (1) all labour expenses (manual, horse and machine) of cultivation, seeding, manuring, liming, harvesting and transporting, either to where consumed on the farm or to where delivered on the market, together with (2) the cost of seed, manures, etc., actually used by the crop, and (3) a proportionate share of the overhead expenses, such as rent, rates, taxes, insurance and general or establishment charges. In the opinion of most economists, it must also include (4) a charge for interest on the working capital and (5) a proportionate share of the expenses of management. As regards (1) the only item which calls for special remark is the cost of transport or marketing expenses. It is customary to estimate the cost up to the time the crop is harvested and stored on the farm, and then to speak of the figure so obtained as the cost of production. Now the cost of marketing a crop varies directly and considerably according to the distance from the market, whereas the charge for rent and certain other items also varies considerably, but *inversely* as the market-distance; and, further, it is generally understood that the net profit is represented by the excess of monetary returns over cost of production. Hence, unless the total cost is taken, erroneous impressions would be created as to the net financial returns or profit. It follows that, for a given crop, the cost of production will differ according to whether it is consumed on the farm or sold. When consumed, the cost might be called the *Farm Cost of Production;* when sold, the *Sale Cost of Production.*

Nothing need be said at this stage regarding items (2) and (3), but a few words are necessary as to (4) and (5). According to some authorities, no charge for interest on capital can properly be included in the cost of production. The question is much too complex to be discussed here; but the writer is strongly of opinion that no estimate of the cost of a farm

crop is complete unless allowance has been made for interest on the necessary capital directly involved in its production. Similar remarks apply to the charge for expenses of management.

The cost of labour under (1) must include the market value at current rates of wages of any work done by the farmer himself, as on a small or medium-sized farm where the farmer acts the dual rôle of manager and worker. If now, in the case of a large farm, on which the farmer's time and energies are fully occupied with the actual management, no allowance is made for this item, it is clear that a fair comparison cannot be made between the cost on a large and on a small farm. Or again, the farmer's place may be taken by a bailiff or grieve whose salary must be charged against the various farm products.

To sum up, *the Cost of Production should be such a figure as will represent the minimum net price at which a certain crop can be sold or otherwise realised if the farmer is to get* (*a*) *a fair return on his invested capital and* (*b*) *a reasonable remuneration as manager of the business.* Any other conception is likely to result in misleading impressions being spread as to the net profit to be derived from crop-production as compared with other industries ; no comparisons as to net profits can legitimately be drawn between the large and the small farm, between the farm managed by the farmer and that managed by a bailiff, and so on, unless this definition of cost of production is strictly adhered to.

Labour as a Factor in Cost of Production.—It is well known that the labour-bill is a predominant item in the cost of production of any crop ; so much so that it merits preliminary and special consideration. Manual labour is generally bought at a known or easily calculated cost but, on the other hand, it usually happens that both horse and machine labour are produced on the farm at a cost which admits of less easy computation. It is desirable, therefore, to indicate (*a*) how the total cost of labour can be ascertained and (*b*) how this cost can be accurately distributed over the various products on which it is expended.

Manual Labour.—As regards the cost of manual labour, it is only necessary to point out that it must include not only the cash wages of hired workers but also the value of allowances or perquisites, the contribution of the farmer under the National Insurance Act, and, in addition, the value of any work done by the farmer and by members of his household. In all cases of

doubt, the calculation should be based as far as possible upon what such labour would cost the farmer if he were under the necessity of having to pay for it all in cash at current rates of wages. Suitable daily records must be regularly made out in order to distribute the total cost over the various products. In the case of regular workers, engaged by the year or half-year, the suggestion may be made that it is not sound in principle to charge their labour at a uniform rate per day or per hour all the year round—as is commonly done. Under this method, we find that regular skilled workers cost, say, 5*d*. per hour during hay and grain harvest, while less experienced workers cost 6*d*. per hour. It would be more rational to charge the former with at least as high a rate as the latter and thus enable the cost to be reduced against less critical operations such as ploughing, dung carting in winter and so on, and especially against non-remunerative work, such as cleaning harness, tidying the stack-yard, etc. It is possible, however, that any difference in the cost of a certain crop which might emerge under the two methods would fall within the limits of unavoidable error, in which case the simpler method might be preferred.

Horse Labour.—Various methods of charging the cost of horse labour have been put forward. It has been suggested that it should be "sold" to crops, etc., at a rate varying according to the "value" of the work done. Thus, a day's drilling of corn would be charged at one rate per day or per hour, a day's dung carting in winter at another rate, and so on. Several objections might be urged against this method, but the fundamental objection is that it would in all probability result in showing either a profit or a loss on work-horses which, in the writer's opinion, is far from being sound book-keeping. The generally accepted method is to charge horse labour at its cost of production, just as manual labour is charged at its purchase price.

The chief item in the production of horse labour is, of course, the cost of the horse's food, and here an interesting and difficult problem presents itself. Farm horses are largely fed on oats, hay and straw, in the production of which horse labour is largely used. Hence, to attempt to show how the actual cost of both horse labour and crops may be determined would be to reason in a circle. A starting point in the circle must be fixed somewhere and it is certainly most convenient as well as most rational to commence with horse labour. The writer strongly advocates that oats and hay should be charged at

their market value on the farm at the time of consumption, while straw should be priced at a nominal figure which may or may not approximate closely to its farm market value.

Two chief reasons may be given in support of this proposal. In the first place, unless saleable foods are charged at their market value the actual monetary advantage to be gained by the substitution of mechanical for horse labour will not be apparent. The comparative cost of machine labour can only be determined after making allowance for the return received from the sale of oats and hay which would otherwise be fed to horses. Secondly, in dealing with market prices we are dealing in facts, whereas any other basis for figuring the cost of such foods would be largely supposititious. Further, readers of this *Journal* will have noticed that farmers have been advised to economise in the cost of feeding farm horses, that is, in the cost of horse labour, by substituting purchased concentrates for a certain proportion of the oats usually fed, and this recommendation indicates that oats are being charged at their market value.

In obtaining the cost of horse labour, account must also be taken of the cost of litter and of overhead expenses, such as shoeing, depreciation and upkeep of harness, stable utensils, share of rent, rates and taxes, insurance, veterinary attendance, depreciation (if any), interest on invested capital and share of general and management expenses. In some cases a charge may also be made for the cost of attendance, but since this will usually be part of the work of the regular horsemen or ploughmen care must be taken to make a corresponding deduction from the cost of manual labour. On the other hand, a deduction must be made from the total cost for the value of the manure produced, the estimation of which will be discussed later. Generally, foals should be kept out of the horses' account, although in certain cases this would not be so, *e.g.* where young horses are bred expressly for farm use, to obtain a cheaper supply of horse labour.

The method of arriving at the net cost of horse labour having been agreed upon, it is next necessary to arrange for the careful recording of the number of hours worked as a whole and also of the distribution of the labour over the various crops. The usual method of procedure is to divide the net cost by the total number of hours worked, thus getting the average cost per horse-hour, and this rate is then charged alike in all farm operations. Similar remarks apply here as were made in the same connection under manual labour.

Mechanical Labour.—The cost of mechanical labour will of course be based upon the cost of upkeep (fuel, replacement and repairs) of the machinery, the rate of depreciation and the interest on the invested capital. The cost of a machine hour can be determined by the same method as for horse labour and a charge made against each crop according to the machine labour expended on it. Wherever expensive, modern machinery, such as a motor-plough, is in use, great care is necessary in reckoning the charge to be made for it, otherwise misleading impressions may be formed as to the relative economy of horse and machine labour.

Method of Stating Cost of Labour.—In certain cases, it is sufficient to figure the total cost of each form of labour, but usually more than this will be necessary, and for this reason: it is generally recognised that the cost of a dressing of dung or of lime should not be wholly charged against the crop to which it is actually applied, but must be distributed over several crops according to the benefit received by each. Now, the cost of such a dressing comprises not merely the price of the materials but also the cost of transit to the farm and the cost of application to the land. A dressing of 2 tons per acre of ground limestone may cost £2 10s. as to material, but the total cost may quite easily amount to £3 or more, while the total cost of a dressing of dung largely consists of the labour costs of carting and application. Hence it follows that the labour records must be compiled and the cost-sheet arranged so as to show as accurately as possible the total cost of the various factors of production—cultivation, manuring, liming, etc.

Cost of Production of the Swede Crop.—It is now possible to examine more closely the data which are required in the preparation of reliable cost-sheets for the various farm crops. In the first place, by way of example, the case of the swede crop will be taken, consideration of which will introduce most of the difficulties which will be met with in such work.

The Cost-Sheet.—Reduced to its simplest and ultimate form, the cost-sheet for swedes would be framed on the following lines:—

A—Direct costs (prime cost) per acre:—

(1) Cost of ploughing.
(2) Cost of seed and sowing.
(3) Cost of singling.

(4) *Net* cost of preparing the land (including autumn cultivations) and of tillages during the growing season.
(5) *Net* cost of lime, haulage and application.
(6) *Net* cost of artificial manures, haulage and application.
(7) *Net* cost of dung, haulage and application.
(8) Cost of lifting and carting to where consumed or marketed.

B—Indirect costs per acre :—
(9) Proportionate share of rent, rates, taxes and insurance.
(10) Proportionate share of general and management expenses.
(11) Charge for interest on average outlay (invested capital).

It will be a great advantage and conduce to more accurate results if the records are kept for a fairly large field entirely under swedes, and it is highly desirable that records should be kept on the same farm throughout a number of consecutive seasons in order to show the effect of the weather or season upon the cost of production. From a practical point of view, the most useful figure is the average cost of production per ton on the same farm over a number of seasons, although from an economic point of view a general average over both farms and seasons is also desirable. A few explanatory remarks may now be made on each of the above items.

Nos. (1), (2) and (3) call for no special attention, the cost being entirely chargeable against swedes.

(4) *Cost of Tillage before and after Sowing.*—This item includes, of course, the cost of harrowing, cultivating, ridging, etc., before, and of scarifying, drill-harrowing and grubbing, weeding, etc., after sowing. The reason for keeping these costs separate has already been indicated. The swede is one of the "cleaning" crops in the rotation and, ordinarily, one of the objects in growing it is to get the land thoroughly broken up and cleaned. Hence, it would be obviously unfair to charge this crop with the whole cost of cleaning, since the work is done for the benefit of practically all the crops in the rotation. The question at once arises : upon what principle can we reckon the proportion actually chargeable to swedes ?

As a starting point, we might assume that the land was perfectly clean, friable and easily broken up, in which case the whole cost of the above work might be made a charge on swedes. But even here it must be realised that the swede crop—as a crop—exerts a beneficial effect upon succeeding crops, although it is impossible to translate this effect into terms of money. At the other extreme, we find land which is foul or difficult to work, or both, and which requires a maximum amount of preparation before it is fit for swedes. In this case, it will readily be admitted that only part of the

cost can in fairness be charged to this crop. On the other hand, it must also be kept in mind that swedes are benefited by the growth of preceding crops, such as pasture, oats and wheat. Bearing these considerations in view, it is the business of the investigator, having regard to the special circumstances of each case, to distribute as fairly as possible the cost of these operations amongst swedes and the succeeding crops in the rotation. The proportion to be carried by swedes may vary from as high as 95 down to as low as 50 per cent. With the greatest of care, the correct answer to such a problem must still be largely a matter of opinion.

(5), (6), (7) *Cost of Manures and Lime.*—Our aim here must be to determine what proportion of the total cost of manuring and liming is utilised by swedes, or at any rate exhausted during their year of growth. As regards artificial manures and lime, the question is simplified by the fact that the actual cost of these materials is known, while the cost of haulage, mixing and application can, with suitable records, be reliably determined. The experienced worker should also be able to distribute with a reasonable degree of accuracy the total cost over the various crops benefited by such applications, thus arriving at the net cost of artificial manures and lime for swedes. Similar remarks, except as regards distribution, would apply to purchased dung or town manure.

Wherever (home-made) farmyard manure is used, however, we have first to estimate the actual "cost" of the manure applied, and then to distribute this cost over the various crops benefited. As to the former, there is much difference of opinion. There are those who hold that only the labour costs of carting and application should be reckoned, the manure itself being looked upon as part of the soil which has been changed into its present form through the agency of crops and live stock. This method has the merit of simplicity, but the serious drawback of great inaccuracy. It would result, for example, in the same charge being made for a ton of manure made by stock getting only turnips and straw as for a ton made where the stock had been heavily fed with concentrated feeding stuffs, while a ton of fresh, unrotted and "strawy" manure would be valued at the same rate as a ton of well-rotted and concentrated manure. A second method which has been suggested is to charge the dung at its "cost." This does not represent the actual cost of production, since it appears impossible to determine the actual cost of each of the three elements in the continuous cycle formed by crops, stock and

dung, but is based upon the manurial values of the foods consumed by the stock producing the dung, that is, the charge for dung is based upon its *value* as a manure. On the Continent again, the manure-value of dung has been determined by carrying out very numerous local field experiments over a number of years, in order to compare the returns on different soils and with different crops from dung and purchased artificials, thus giving an *objective* value to the dung instead of a *subjective* value as obtained under the second method.

The question is much too intricate to be fully discussed in such an article as this. Although the writer considers the Continental method to be entirely sound in principle and also possible of application in this country, he does not recommend it meanwhile, because sufficient experiments of the kind indicated have not yet been made. In fact, there seems at present no better way of figuring the charge to be made for dung than to accept the arbitrary though fairly well-standardised figures which are commonly used in valuations between outgoing and in-going tenants. The charge per "yard" or per ton for the dung itself, will of course vary according to its "quality," and also according to the current prices of artificial manures, while the total charge per acre will depend upon the quantity applied and the labour costs of haulage and application.

The method here suggested must not, however, be too rigorously applied. Exceptions will occur where the home-grown foods have been wholly charged to stock at their farm market value instead of at their cost of production, as will generally happen, and also where a certain proportion of the dung used has been purchased. In the former case at least, the dung should be valued on a market basis by figuring what it would cost to bring dung of a like quality on to the farm in the event of all the crops being sold off and no stock kept.

As to the proportion of the cost of a dressing of dung which should be charged against the swedes, no hard and fast rule can be laid down. It is recognised that it will vary very widely according to a variety of conditions—soil, rainfall, system of farming, kind of stock producing the dung, other manures applied, extent of dressing and so on—and each case must be judged on its merits. On poor, sandy soil, and with a moderate dressing, as much as 80 per cent. of the total cost might be carried by the swedes, while on loams in good condition and with a heavy dressing the proportion charged might be as low as 40 per cent.

Consideration of this question of manure-costs makes it perfectly clear that the qualified investigator into problems of cost of production must have not only a knowledge of the principles of book-keeping and cost-accounting but also a wide experience of field experiments on manuring, liming, etc.

(8) *Cost of Lifting, etc.*—The swede crop may either be eaten off on the ground, lifted and stored for consumption on the field or at the steading, or lifted and marketed. In any case, this group of expenses will include the cost of the work done up to the time the crop is realised. The actual cost of feeding—cutting or pulping—is, however, generally made a charge against the live stock. In certain cases, a deduction may be necessary at this stage for the value—feeding or manurial or both—of the swede "tops," but the estimation of this item is not a very serious matter.

(9) *Rent, Rates, Taxes and Insurance.*—The method of dealing with this charge can be best illustrated by means of a concrete example. Suppose an ordinary arable farm of 300 acres is rented at £300 per annum, that the total rates and taxes paid by the farmer amount to £50 per annum, and that insurance (not including life assurance and insurance of farm workers) equals £20—a total of £370. Now it must be understood that the whole of this is not a farm expense. The income tax is purely a personal levy—it is a levy on the farmer's income, not on the farm—and has first to be deducted. Further, part of the rent, rates and other taxes is chargeable to the farmer as a personal expense against the use of the farm dwelling-house. Suppose the income tax is £20 and that the farm dwelling-house is valued at £20 per annum, this leaves £330 to be charged against the farm. The insurance can generally be accurately distributed over crops, live stock and establishment, while the remaining £310 is the actual expense to be carried by the land or crops and the farm buildings or live stock, etc. The charge for rent, etc., against the buildings should be based upon the interest on the capital outlay. In this case, the buildings (excluding dwelling-house and cottages) might have cost £1,000. If we allow 5 per cent for interest and sinking fund, the charge for rent would be £50, say £55 inclusive, leaving £255 as the actual charge against the land. It is most unfair to crops to burden them with the whole of the expense, as is commonly done. Lastly, this £255 must be distributed over the various fields according to the quality (crop-producing powers) of the soil in each. Thus, we would have so many acres at 25*s.* per acre, so many at 22*s.*, 20*s.*, and so on.

Where the quality of the soil varies, as it usually does, it is essential that the charge for rent, etc., should also vary, and it will often happen that the variation as between the best and the worst soil is as much as 10*s.* per acre.

(10) *General and Management Expenses.*—In compiling cost records it is important that the amount entered as general expenses should be kept as low as possible and the total for the year will be distributed over the various crops according to the relative importance of each in the farm economy. As to management, the question is: how can we determine the total allowance to be made to the farmer for managing the farm? Obviously, it cannot be based upon the skill of the farmer—that is, on the net returns—for that is a very variable item and just as the *cost* of manual labour does not depend upon the skill of the worker so may it be said that the cost of a manager does not depend upon his efficiency. Let us assume, however, that a farmer has several farms, one of which he manages himself while each of the others is in the hands of a bailiff or grieve. It would appear to be quite reasonable to make the farmer an allowance on the basis of the salaries paid to his managers, and the same principle can be applied to practically all cases. On large farms, the whole of the farmer's salary as manager would be reckoned as expenses of management, but on small and medium-sized farms, part of the cost would be counted in the manual labour. In ordinary book-keeping it is, perhaps, more usual not to make any charge for management, where it is done by the farmer, and the net profit then shown is called the farmer's "labour income," but in determining costs of production it is imperative that this item should always be included in the records. The total charge for management will of course be distributed over crops, etc., according to the time and care required by each.

(11) *Interest on Capital.*—This may be calculated at the rate of 4 or 5 per cent. per annum on the average outlay on the crop. The rate will vary according to (*a*) the state of the money market, (*b*) the risk involved with the particular crop under consideration.

The Acre Basis.—It is not intended in this article to deal with the various forms of records which are necessary in determining the cost of production of farm crops but a word may be said here as to the unit which should be adopted for comparison purposes. In ordinary cases, all the data should be reduced to an *acre-basis*, rather than to a yield-basis—that is, so much per acre rather than so much per ton or quarter or barrel.

The cost of producing a crop does not vary according to the yield, and with certain crops the cost will be very little more for a large than for a small one. By introducing the yield we introduce a very variable factor, and this would give rise to misleading conclusions as to the economy which had been exercised in production. In one district swedes may cost 8*s.* per ton to produce, in another, with similar soil, etc., and other conditions, the cost may be 12*s.*, but the higher cost of the latter may be due to causes over which the farmer has no control and not to any lack of skill in management. Comparisons on a yield-basis would be permissible and preferable only when made over a long period of years.

Probable Error in the Result.—It is evident that the figure thus obtained for the cost of production of the swede crop must not be looked upon as being mathematically correct. In more than one item, the charge made is partly a matter of opinion and, consequently, different workers would arrive at different results with the same case. This difference may be called the "probable error," and should always be reckoned with. It will be large for some items in the cost sheet and comparatively small for others.

The Cost Sheet Completed.—On completion, the cost sheet for the swede crop would possibly appear something like the following :—

Nature of Expense.	*Net Cost per Acre.* £	s.	d.	*Probable Error.* Per cent.	*Minimum Cost.* £	s.	d.	*Maximum Cost.* £	s.	d.
(1) Ploughing	0	10	0	5	0	9	6	0	10	6
(2) Seed and sowing	0	3	9	—	0	3	9	0	3	9
(3) Singling	0	8	0	—	0	8	0	0	8	0
(4) Other tillages	0	12	6	10	0	11	3	0	13	9
(5) Lime	0	10	0	15	0	8	6	0	11	6
(6) Artificial manures	1	0	0	10	0	18	0	1	2	0
(7) Farmyard manure	1	10	0	20	1	4	0	1	16	0
(8) Lifting and storing	1	0	0	5	0	19	0	1	1	0
(9) Rent, rates, taxes	0	15	0	10	0	13	6	0	16	6
(10) General and management expenses	0	10	0	10	0	9	0	0	11	0
(11) Interest on outlay (4 per cent)	0	5	0	—	0	5	0	0	5	0
	£7	4	3	10	£6	9	6	£7	19	0
Cost per ton (yield 15 tons)		9	7	10		8	7		10	7
" " (" 25 "		5	9	10		5	2		6	4

The records have shown that the cost per acre amounts to £7 4*s.* 3*d.*; further, we can be reasonably certain that the net cost is not less than £6 9*s.* 6*d.*, nor more than £7 19*s.*, and there is a high degree of probability that it lies very near £7 4*s.* 3*d.* This method of interpretation serves to emphasise the fact

that where the sources of unavoidable errors are so frequent every endeavour must be made at every point in the investigation to obviate all sources of avoidable errors.

Other Data Obtainable.—The yield per acre having been ascertained, the *cost per ton* can at once be determined, while it will also be possible and desirable to reckon from the records :—

(1) the number of hours of manual labour and of horse labour required to produce (*a*) an acre and (*b*) a ton of swedes,

(2) the distribution throughout the year of manual and of horse labour, and

(3) the proportion which the cost of each of the factors in production—manual labour, horse labour, manures, rent, etc.—bears to the total cost. This would enable a statement to be prepared showing, for example, the effect on the cost per acre of a 20 per cent increase in the cost of hand labour, compared with the same increase in the cost of manures purchased or in rent. In this article, however, it is impossible to do more than merely mention such aspects of the question but they are none the less important. Indeed, it may be said that the main benefit in cost-records lies not so much in the actual results but in the careful and detailed analysis of the various factors which have brought about the results.

The above principles can be applied, broadly speaking, in the determination of the cost of production per acre of any farm crop, and in many cases the result will be much more mathematically accurate than in the case of swedes. In certain cases, special difficulties will be met with, but these should not prove insurmountable.

Grain Crops.—In translating the cost per acre into cost per unit of yield, a very important question arises in the case of all grain crops and also of seeds hay. Suppose the total cost per acre for a crop of *oats* amounts to £7, *how is this cost to be distributed between grain and straw?* No strict rule can be laid down but three typical cases may be considered, *i.e.* (1) where both grain and straw are readily saleable, as in the vicinity of large towns, (2) where the crop is grown chiefly for the grain with the straw as a useful by-product, and (3) where a principal object is to get a good yield of straw of high fodder quality, as in the western dairying districts.

The first case presents little difficulty. It may be assumed that the farmer desires to get as large a yield of straw as is compatible with a high yield and quality of grain and. further, that his desire will be influenced by the relative demand, *i.e.*

market value *on the farm*, for the two products. Hence it is perfectly fair and reasonable to distribute the cost according to the relative farm market value of grain and straw. If the total cost per acre is £7, the total market value of the grain £10, and of the straw £4, then the cost of the grain would be $\frac{10}{14}$ of £7, and that of the straw $\frac{4}{14}$ of £7, from which the cost per quarter and per ton, respectively, can easily be found. If the market value of the grain rises, then the proportion charged to the grain will also rise, and this is quite sound, since the higher the relative value of the grain the greater importance will the farmer attach to this product.

In the second case, however, the farmer looks upon the straw very largely as a by-product in grain-production. Normally, he has no intention of selling, partly because of the low *farm* market value caused by the high cost of marketing, and partly because he has a better use for the straw on the farm. In other words, the farmer would grow less straw if he could do so without affecting the yield of grain, and hence the grain should be made to carry a higher proportion of the cost than under the method first given. In the dairying districts again, the farmer desires a large yield of good quality straw not so much because of its possible market value as its fodder value, and his estimate of the relative value of straw would be higher than that formed by a consideration of the relative market values.

It would appear that, in the second case, the value given to the straw should be rather less than the farm market value, while in the third it should be somewhat higher, after which the relative cost of grain and straw can be calculated as already explained.

The use of arbitrary figures in such cases is unavoidable, and it is admitted that the above suggestions are largely tentative. Whatever method is adopted, the guiding principle should however be to distribute the cost according to the relative importance attached by the farmer to each product, starting from the assumption that if straw had no value the whole cost would be charged to the grain and working up to the case in which great stress is laid upon both the yield and quality of the straw. A serious difficulty in practice is to estimate with any considerable degree of accuracy the actual yield of straw per acre, but with the expenditure of a little extra time and labour this difficulty can be surmounted.

In conclusion, the writer wishes to make two important general observations. Firstly, it will be apparent that any

error made in the determination of the cost of production of crops consumed on the farm will be included in the cost records for live stock and their products, and should the error be very great it might lead to entirely erroneous conclusions being drawn as to the relative economy of crop-production, cattle-feeding, milk-production, and so on. Secondly, although in this article the crop has been taken as the unit this has only been done for the sake of clearness and brevity. The writer is very strongly of the opinion that *the true economic unit in crop production is the rotation*, and not the single crop.

THE NUTRITIVE VALUE OF EDIBLE FUNGI.

SUGGESTIONS are frequently received that the use of edible fungi should be encouraged, particularly in times of shortage like the present. Such suggestions are largely founded on the widespread popular belief that the nutritive value of mushrooms and other edible fungi is very great. It is now known that this is not the case, and in view of the well-known risks attaching to the use of fungi as food by persons not very well acquainted with the plants, it is desirable that the true facts as to their place in the diet should be more widely understood.

The idea that fungi are highly nutritious originated in the fact that analyses have shown them to contain a relatively large proportion of nitrogenous compounds. It was formerly customary to assume that the total amount of nitrogen present represented "crude protein," the valuable formative constituent of such foods as meat, fish, beans, etc.; hence it is chiefly as a proteid or "flesh-forming" food that fungi have been recommended.

There are, however, several sources of error in this assumption. The total amount of nitrogen present is not all in the form of proteids; much of it may represent simpler compounds of little or no nutritive value; moreover, in the fungi a certain proportion of nitrogen enters into the composition of the indigestible substance forming the cell-walls, or "fibre," and is thus of no use to the human body. Furthermore, it does not follow that the whole of the proteid matter present can be digested, and so become available for the nutrition of the body.

Numerous analyses of edible fungi are on record. The figures vary considerably even in the same species, possibly according to the age of the specimens examined or other factors.

In general, fungi contain in the fresh state from 80 to 94 per cent. of water, the average being about 90 per cent.; in this respect they correspond with succulent vegetables such as cabbage, turnips, etc. This fact alone must render the nutritive value of fresh fungi very low.

The total nitrogen content as given in different analyses varies from about 1 to 8 per cent. of the dry matter; but according to König* from 16 to 37 per cent. of the nitrogenous substances present are not of a proteid nature. Furthermore, the proteids of fungi appear to be less soluble than those of other plants, and experiments have shown that a considerable proportion resist digestion. According to Mörner†, the total amount of nitrogen present in the dry substance of certain species, its distribution as proteid and non-proteid, and the proportion of the nitrogen which he found to be digestible are as represented in Table I.

TABLE I.—*Nitrogenous Compounds in Mushrooms (Mörner).*

—	Total Nitrogen.	Extractive (non-proteid) Nitrogen.	Proteid-Nitrogen.	Digestible Proteid-Nitrogen.
	Per cent.	Per cent.	Per cent.	Per cent.
Lepiota procera (Parasol mushroom), cap ..	6·23	2·02	4·21	2·99
Agaricus campestris (Common mushroom), cap ..	7·38	2·49	4·89	3·64
Agaricus campestris (Common mushroom), stem ..	6·02	1·98	4·04	2·88
Boletus edulis, cap	3·87	1·14	2·73	2·10
,, ,, stem	3·30	0·95	2·35	1·76
Morchella esculenta (Morel)	4·99	0·81	4·18	2·19

The percentages are calculated on the dry substance.

From these results it follows that the available protein in the fungi is considerably less than was formerly estimated, when the total nitrogen content was taken as representing digestible proteid substances. Even lower figures than those of

* König. *Die menschl. Nahrungs und Genussmittel*, 1904, 4 Aufl., II., p. 945.
† C. Th. Mörner, in *Zeitschr. f. physiol. Chemie*, X, 1886, p. 503.

Mörner were obtained by Mendel,* as exemplified in the case of *Coprinus comatus* and *Morchella esculenta*.

TABLE II.—*Nitrogenous Compounds in Mushrooms (Mendel).*

——	Total Nitrogen.	Extractive Nitrogen.	"Crude proteid-" Nitrogen.	Digestible proteid-Nitrogen.	Indigestible proteid-Nitrogen.	Digestible proteid-(N × 6·25)
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Coprinus comatus	5·79	3·87	1·92	0·82	1·10	5·12
Morchella esculenta	4·66	1·17	3·49	1·44	2·05	9·00

The percentages are calculated on the dry substance.

Winterstein and Reuter, on the other hand, have indicated a much higher digestible proteid content for *Boletus edulis*.† It is obvious that there is need for further work in this direction. Most investigators, however, appear to be agreed that the amount of available proteids in fresh fungi approximates to that of other fresh vegetables; it is far below that of dried beans and peas, and fungi therefore cannot be considered as a substitute for meat.

The fungi contain very little fat. The figures given for various species vary from 0·12 to 0·93 per cent. of the fresh substance, and these figures probably include some free fatty acids. Carbohydrates, however, are relatively abundant, although starch, the chief carbohydrate of other plants, is not present. The carbohydrates may amount to 50 per cent. of the dry matter, or at most 10 per cent. of the fresh substance, and include glycogen, mannite, trehalose, glucose, etc., as to the nutritive value of many of which little is known. A varying proportion of fibre is present, which is useless as food.

The ash varies from 0·48 to 2 per cent. of the fresh substance. It contains chiefly potassium and phosphoric acid, with varying quantities of other mineral substances.

Summarising the results obtained from the analysis of various edible fungi, and comparing them with other foods, it is obvious that mushrooms can in no sense be regarded as substitutes for flesh-forming foods, such as meat. It may be noted that the common mushroom (*Agaricus campestris*) is richest in proteid substances of all the species examined.

* L. B. Mendel, in *Amer. Journ. Physiol.* I., 1898, p. 232.

† E. Winterstein and C. Reuter, in *Zentralbl. Bakt.*, Abt. 2, Bd. xxxiv, 1912, pp. 571-572.

Even so, however, its proteid content is no higher than that of cabbage or potatoes, and in total nutritive value it is far inferior to the latter on account of its poorer carbohydrate content.*

Fungi, therefore, cannot be ranked with the essential foods. At the same time they are not to be looked upon as absolutely worthless. They may be made to serve a useful purpose as food accessories. Their agreeable flavour renders them especially suitable as flavourings or for use along with other more nutritious foods; variety and palatability are well known to be important factors in the question of diet. From this point of view, however, *purchased* mushrooms in this country are usually not an economical addition to the menu; but where edible fungi can be gathered or obtained very cheaply they may take their place in adding variety to the diet.

Too great care cannot be exercised with regard to the use of edible fungi by persons not very familiar with the different species. The determination of species of Agarics, or gill-fungi, is by no means easy, and even mycologists of some experience may sometimes be deceived by close resemblances between edible and poisonous species. There is no test which can be used for the detection of poisonous varieties, and the soundest advice which can be given to the would-be fungus-eater is not to experiment unless he is absolutely certain of the species with which he is dealing, and never under any circumstances to eat fungi which are not perfectly sound and unattacked by insects. In cases of doubt expert advice should be asked.

* Potatoes contain about 22 per cent. carbohydrates, calculated on the fresh substance.

Pig-keeping in Towns and Villages: A Practical Guide.*

PEOPLE who possess a fair-sized garden or allotment can usually arrange to keep at least one pig.

The essential conditions are :—

1. Selection of type of pig popular in the district.
2. Cheap but weatherproof sty with adequate ventilation.
3. Regular and sufficient feeding.
4. Systematic collection of house refuse to cheapen cost of upkeep.
5. Plentiful supply of vegetable matter.

Type of Pig.—The small pig-keeper should select the type of pig that is the most popular in his district, the reason being that should he wish to sell he will probably have to rely on a local buyer. *This is important.* Pork, rather than bacon, should be the aim.

For making into pork, Berkshires, Middle Whites, Lincolnshire Curly Coated and Gloucestershire Old Spots, are preferred by many pig-keepers, but any good quality sow of local breed crossed with one or other of the breeds referred to will generally answer the purpose.

A start should be made with a newly-weaned pig, about eight weeks old. An extra shilling or two spent in a good pig will be amply repaid. It must be an animal with a vigorous constitution—a greedy, lusty fellow, active on his legs, lengthy and round in shape.

Housing.—No elaborate structure is necessary. The main essentials are comfortable and clean conditions, with a dry bed, suitable ventilation, and the absence of draughts. The foundation must be dry, and the sty should, if possible, face the south. In the higher parts of the walls openings should be provided through which the passage of air may be easily regulated, in order that the temperature may be kept as even as possible throughout the year. A cheap, wooden erection would serve, or the walls may be built of brick or concrete, or wood on a brick foundation, and the building may often take the form of a lean-to. It should be high enough to obviate all difficulty in cleaning out. A roof of wood covered with thick tarred felt will suffice to keep out cold and wet. The floor is the most important part of the sty. Concrete is the most suitable material. This should be left rough to

* This article is Special Leaflet No. 71, about to be issued, and copies of which will not be sent to contributors to the *Journal*.

afford a foothold. Part of the floor, sufficient to provide bed accommodation for the pig, should be covered with a movable wooden platform. Hard bricks also make a good floor. To ensure drainage the floor should slope gently to the front of the sty. The drainage should not be wasted, but should pass into some convenient receptacle, or into a sunk dung-pit for use in the garden with the pig's manure.

Bedding.—Where straw is not available, dried bracken, grass and leaves make thoroughly efficient bedding. Every effort should be made to provide an abundant supply, especially in cold weather.

Feeding.—For several weeks after weaning the pig should receive its food in a moderate sloppy condition, slightly warm if the weather is cold. The food may consist of kitchen waste (a very small quantity until the pigs are about 12 weeks old), and a little coconut cake (soaked overnight), or sharps, and sufficient water should be added to give the whole the consistency of gruel. A newly-weaned pig will usually require about 2 lb. of food per day, 1 lb. of which should consist of coconut cake or similar material.

The young pig should be fed regularly three times a day, the food being gradually increased, as much being given at each meal as it will readily clear up. Dried blood, meat, and fish scraps, a little at a time, are desirable.

It is important that vegetable food should form part of the diet at all seasons. Young grass from the wayside, weeds from the garden, and similar material will all be picked over by a young growing pig. In the dead of winter reliance must be placed chiefly on small potatoes, and on parsnips, turnips, artichokes, etc.

Forced Feeding.—When the pig is about 100 lb. in weight feeding should be rather more forced. Meal may be given more freely, and vegetable foods reduced.

Another important point to remember is the necessity of supplying a regular allowance of gritty material, preferably small coal or wood ashes, or, failing these, earthy turf.

A pig should weigh from 170 lb. to 180 lb. from 5 to 6 months old, when it should be ready for killing. The amount of food required at this stage will be from 5 to 6 lb. of meals or their equivalent daily, and the dressed carcass should weigh from 130 lb. to 140 lb.

Rations.—A few examples of rations are appended. In each case Ration 1 represents a mixture of feeding-stuffs in common use in the past, while the alternative (Ration 2) shows how by using other feeding-stuffs the diet may be cheapened, and restricted mainly to materials not required for human food.

Along with the foods specified it is intended that the pigs should receive a moderate allowance of house refuse, or such roots and green forage as may be available. The precise amounts will depend on the kind and quantity of the other food material available. In the case of pigs of 14–16 weeks and over it may be possible in some cases to feed them almost wholly on kitchen waste. In the winter months roots should be boiled and mashed and the meals incorporated immediately before feeding. About 4 lb. of waste potatoes or sugar beet, or 5 to 6 lb. of parsnips, or 8 to 10 lbs. of carrots, turnips, cabbages, etc., are equivalent to 1 lb. of mixed cereal meals for pig-feeding. Such vegetable material should be used in the proportion of 4 or 6 lb. to 1 lb. of meal. For pigs up to 3 months old, at least a little skim or separated milk is most beneficial, and when procurable at about one-sixth of the cost per lb. of mixed meals, it will invariably prove economical (1 gal. of milk weighs approximately 10 lb.). Whey is also useful but is worth appreciably less than skim milk.

Rations for Pigs of 25–60 lb. Live Weight.

(1) ¾ lb. Middling
¼ ,, Barley Meal.

(2) ¼ lb. Bran
¼ ,, Coconut cake or Linseed Cake Meal ..
½ ,, Sharps
or
¼ lb. Fish Meal.
¼ ,, Maize Gluten Feed.
½ ,, Sharps or Bran.

Rations for Pigs of 69–100 lb. Live Weight.

(1) 1 lb. Sharps.
1 ,, Barley Meal.

(2) ¼ lb. Middlings
¾ ,, Dried Grains ..
½ ,, Palm-nut Cake, Coconut Cake or Bean Meal
¼ ,, Fish Meal
or 2 lb. Maize Gluten Feed.

Rations for Pigs of 100–180 lb. Live Weight.

(1) 1 lb. Sharps.
1 ,, Barley Meal.
1 ,, Maize Meal.

(2) 1 lb. Maize or fine Middlings
1 ,, Dried Grains
1 ,, Palm-nut Cake, Coconut Cake or Bean Meal } *or* 3 lb. Maize Gluten Feed.

In an experiment* with pigs recently conducted in Yorkshire, it was shown that palm kernel cake and extracted palm kernel meal can be safely used as food for pigs in proportions ranging up to about one-third of the total ration. Finely-ground palm kernel cake would appear to be about equal in feeding value to fine sharps (thirds) and appreciably superior to extracted palm kernel meal.

Collection of House Refuse.—Householders unable to keep pigs themselves may assist by setting aside edible waste material for the feeding of pigs belonging to other people. Where a number of people, either individually or in combination, *e.g.*, a group of allotment holders, erect a piggery, a trolley would be the best means for collection. The garden and kitchen will supply a considerable proportion of the animal's food. Refuse from butchers, poulterers, fishmongers, fruiterers, greengrocers, from dairies, hotels, boarding-houses and other dwelling houses, can similarly be turned into valuable meat.

The necessary organisation and collection of waste material might well be undertaken by local corps of women as voluntary war work.

House Refuse Feeding.—Swill or dish-water should not be used as it contains washing soda or salt, both of which, if given in excess, are injurious to the animal's health. The refuse should be collected and used while fresh and sweet, and if it can be boiled or steamed first, all the better.

Out-door Pig-keeping.—Those who have access to grazing or woodlands are advised, wherever possible, to allow their pigs full run of the land available. The Board specially desire to urge this practice in view of the present shortage of, and need for economy in, feeding-stuffs for live-stock. Full information as to the possibilities of out-door pig-keeping is given in Technical Bulletin No. 9, Series C, of the Food Production Department of the Board. Copies of this Bulletin may be obtained free of charge and post free on application to the Department at 72, Victoria Street, London, S.W. 1.

* *Journal of the Board of Agriculture*, December, 1916.

Growing Wild White Clover for Seed.*

MANY owners and occupiers of grass land hesitate to break up pasture, because of the difficulties anticipated in again laying the land down to grass, should arable farming become unprofitable after the War. To a certain extent misgivings are warranted, for many of those who have attempted to lay down land to grass have found that the formation of a satisfactory pasture has been difficult and expensive. But the difficulties of the past have frequently been caused by an unwise selection of seeds, and recent experience indicates that under suitable treatment the formation of a good pasture is neither so expensive nor so tedious a matter as it is generally supposed to be. It has been proved, for example, that if proper use be made of wild white clover and phosphatic manures the formation of pastures on medium and strong soils may be relatively easy and inexpensive.

Under present conditions agriculturists should not hesitate to break up those pastures which in the opinion of the County Agricultural Executive Committee are required for corn growing. Should subsequent experience indicate that a return to grass is desirable there is reason to anticipate that there will be no great difficulty in forming a satisfactory pasture.

The following particulars respecting the growing of wild white clover for seed are given with the object of popularising the use of this clover, which should form the basis of most of our pastures.

The great value of wild white clover has been definitely established by trials in many parts of the country.† It produces perennial plants, and so gives better results than commercial white or Dutch clover, which dies out more quickly. At Cockle Park, where extensive trials have been conducted, substantial benefits have been obtained from its use as early as the aftermath of the first year's hay, and close, clovery herbage now continues to be produced from the plant up to the eleventh year after sowing.

It is a common experience that the inclusion of wild white clover in a seeds mixture has established pastures of high feeding value within 18 months after sowing, and has been the means of producing large and nutritive crops of hay for some years in succession.

* This article is a reproduction of a Bulletin issued by the Food Production Department.

† References to Reports dealing with the results of trials are given at the end of the article.

Up till now the supplies of wild white clover seed have been limited, but the demand is stimulating the supply. It is of the utmost importance that as much seed as possible should be harvested, and it is hoped that more farmers will take steps to grow their own supplies.

Manuring.— The most satisfactory results have been obtained by applying 7 to 10 cwt. of high-grade basic slag per acre in the autumn following sowing, after harvesting the cover crop. Dressings of dung or of nitrogenous manures develop the grassy herbage at the expense of the clovers, and, therefore, should not be used where it is desired to encourage wild white clover. On light soils known to respond to potash a dressing of salt (about 4 cwt. per acre), or potash manure if available, should be applied in addition. If the land is mown for hay, a further dressing of 8 cwt. of high-grade slag per acre, or its equivalent of low-grade slag, should be applied every third year. If the land is pastured, 5 cwt. every third year is probably ample.

In addition to increasing the productivity of the herbage, wild white clover is an important factor in accumulating fertility in the land, and should always be included in seeds mixtures for leys of two or more years' duration.

Distribution.—Wild clover is present to some extent on most pastures; it is also common on roadsides and on some types of hill grazing. It is a creeping plant of dwarf growth, and is, therefore, easiest to harvest when associated with the smaller grasses only. Most of the wild white clover on the market is at present harvested on the Weald Clay in Kent, Surrey, and Sussex, but it has also been successfully harvested in Gloucestershire and in many of the southern counties. Small lots have also been obtained occasionally from Wales and from Northumberland and other northern counties. The seed should be harvested only from fields that have been down to grass for many years.

Selection of Field and Early Treatment.—Poor pastures with but very little grass are usually selected. These should be dressed with about 7 cwt. per acre of basic slag in the autumn or early winter, and should be grazed over with cattle till the end of May, in order to keep down the grass. The clover should them be fit for harvesting in August or September. If slag is available it may be applied with advantage up to the middle of June. As an alternative, fields which have already received slag, or are naturally full of white clover, should be selected.

Harvesting the Crop.—The crop should not be cut until it is ripe. In most cases the ordinary hay mowing machine, with the knives set as low as possible, will be found quite satisfactory, but when the crop is very short it may be necessary to cut with the scythe.

Opinions differ as to the best methods of handling the crop after it has been cut. Some growers treat it in a similar manner to an ordinary hay crop, but to avoid wasting the seed it is advisable to take certain special precautions. The crop should be shaken as little as possible and handled gently. After cutting, the produce should be collected into small cocks, which are turned at intervals until uniformly dry. The forks should not be dug into the cocks when turning or lifting, but should be run lightly under them; a four-tine fork or a long-pronged stable fork is most suitable for the purpose. The carts or wagons should be sheeted and the cocks carefully loaded when sufficiently dry. Great care must be taken not to allow the clover to heat in the stack. Small lots may be stored in the barns. One successful grower on a large scale leaves his produce on the wagons under a Dutch barn for a day or two before unloading. This grower never makes his stacks more than 3½ to 4 yd. wide, and for every 2 yd. of length he inserts a specially-constructed ventilating passage. Whether stored in stacks or in a Dutch barn the material should be carefully ventilated.

Threshing and Cleaning.—The crop may be threshed by an ordinary corn-threshing machine. A sheet is placed below the machine to collect the clover heads and any seed that may be knocked out. Subsequently the heads are passed through a special clover-dressing machine known as a huller or pugger. The machine commonly used for dressing red clover will only turn out a rough sample, often containing large numbers of trefoil capsules. Most of the larger impurities can be removed by passing the seed over a riddle with a mesh fine enough to let the clover seed pass. The sample will then be suitable for ordinary use, although it will no doubt contain a certain quantity of trefoil seed and the smaller clover and grass seeds. To obtain a pure commercial sample it is necessary to employ a special machine. Such a machine may be purchased, or arrangements made to send the rough seed to a firm that specialises in dressing.

Yield per Acre.—The yield of seed per acre varies considerably. Farmers are generally quite satisfied with 2 to 3 cwt., although larger yields are not unknown.

"Once Grown" Wild White Clover.—"Once Grown" wild white clover has given quite satisfactory results. It is produced from leys in which true wild white clover is the only clover used in the seeds mixture. The seed is harvested when the white clover has fully established itself, that is to say, after two or three years. It is of the greatest importance that the ley should receive no nitrogenous manures, but a good dressing of basic slag (say 10 cwt. per acre) should be applied after the corn has been harvested. The "Once Grown" wild white clover would be harvested in the manner already described. The field should be grazed until about the 1st of June and the clover cut early in September.

Some growers take an early cutting of grass and clover hay about the middle of June. In this cutting the grasses will preponderate, but the second crop will produce chiefly wild white clover.

The seeds mixture sown should consist of about 4 lb. of wild white clover per acre, and suitable grasses for a four years' ley. The latter will keep down weeds and ensure a good sward.

The Seed of Wild White Clover.—The seed of wild white clover is on the average much smaller than that of commercial white or Dutch clover. Samples frequently contain a large percentage of "hard" seed—many samples with 10 per cent. and a few with more than 20 per cent. have been met with. Samples of home-saved seed have been tested by Biffen, Mercer and Jenkin in which the hard seed has varied from 39 per cent. to 80 per cent. Farmers who harvest their own stocks can make a large proportion of the "hard" seed germinate by spreading the mass of seed thinly on a table and rubbing it lightly with some object possessing a flat, gritty surface. Biffen has proved a piece of bath brick to be effective, while Mercer has found that shaking the seed in a box lined with glass paper answers the purpose.

The seed of natural wild white clover differs from that of "Once Grown" wild white clover in the proportion of impurities it contains. The chief impurities met with in wild white clover harvested from old indigenous pastures are: bird's foot trefoil (up to 5 per cent.), yellow suckling clover (up to 16 per cent.), crested dog's tail, bent, and sometimes the meadow grasses with pasture weeds like tormentilla, woodrush, self heal and rib grass—weeds that would naturally come from permanent grass.

"Once Grown" wild white clover usually contains the

seeds of self heal and rib grass, with impurities like the geraniums, madder and bladder campion so often associated with temporary leys; it sometimes contains also a high proportion of red clover seed.

Owing to the high price of wild white clover seed it should only be purchased under a definite guarantee of purity and not in mixtures. When the farmer grows his own seed it is not, however, necessary to subject it to elaborate cleaning operations since the other leguminous herbs contained in home-grown samples are valuable in themselves and the amount of really harmful seeds is usually slight.

It is, however, essential that those farmers who harvest their own seed, and are unable to put it through adequate dressing machinery, should treat it by one of the simple methods described in order to ensure that a high proportion of the "hard" seed will grow.

REFERENCES.

GILCHRIST, Professor Douglas A.: *Wild White Clover* (Farmer and Stockbreeder Year Book, 1917.)

Trials of Wild White Clover (Jour. Bd. Agric., Vol. XVI., No. 9, December, 1909; and Vol. XXII., No. 11, February, 1916).

Annual Guides to Cockle Park (from 1906 till 1916).

JENKIN, T. J.: *Ordinary White Clover Seed versus Wild White Clover Seed* (Jour. Bd. Agric., Vol. XXIII., No. 12, March, 1917).

MERCER, W. B.: *Grass and Clover Seeds* (College Bull. No. 15, Armstrong College, Newcastle-upon-Tyne).

MALDEN, W. J.: *Harvesting White Clover* (The Farmer and Stockbreeder, Vol. XXIX., No. 1402, New Series, 7th August, 1916).

M'ALPINE, Professor A. N.: *Wild White Clover* (Trans. High. and Agr. Soc. of Scotland, Fifth Series, Vol. XXVII., 1915).

PORTER, JOHN: *A Big Stride in Agricultural Improvement* (The Hereford Times, 1916. 6*d.* net.).

VOELCKER, Dr. J. A.: *Report on Experiments conducted in 1888 by Local Agricultural Societies in conjunction with the Royal Agricultural Society* (*Saltney Experiments*) (Jour. Roy. Agric. Soc., Vol. XXV., 1889).

THE following Notes have been communicated to the Board by the Agricultural Organisation Society :—

The Urmston and District Allotments Association.

In no direction is the co-operative principle more adaptable or more useful than in the matter of allotment associations. One of the most striking instances of rapid success achieved co-operatively by allotment holders is the Urmston and District Allotments Association, Ltd. Urmston is in Lancashire, a suburb of Manchester, and lies in the area covered by the North-Western Branch of the Agricultural Organisation Society. The Association, which was formed during the spring of 1916 and registered under the model rules of the Agricultural Organisation Society, presents many interesting features, a study of which may prove useful to other associations now existing or to be started.

Some Advantages.—Co-operation in allotment holding may have other advantages besides those arising directly out of the collective renting of a piece of land, although these latter in themselves are considerable. When land is rented individually or "piecemeal," whether it be through a local authority or direct from a landowner, the interest of the landlord in the enterprise often ends with the collection of the rent. In similar circumstances the interest of the plot-holder in the welfare of his neighbouring plot-holders will probably be slight and not necessarily sympathetic. Where the land is rented as a whole by an association of allotment holders a common interest is at once set up ; the mere holding of the land co-operatively creates the need for a system of governing it co-operatively. From this condition of affairs, given a body of intelligent and enthusiastic men, all sorts of benefits will gradually accrue.

Managing Their Own Affairs.—It may fairly be claimed that the success of most allotment associations is proportionate to the degree of co-operation shown in their management and development. From the outset the Urmston Association has displayed a fine co-operative spirit.

The entrance fee was fixed at 1*s*., with 6*d*. extra for rules and membership card. Each member also holds a 5*s*. share, on which he has to pay up 1*s*. A commencement was made with a field of 5 acres. The land is held direct from the owner at a fair rental, which allows the Association to sublet at the rate of 350 square yards for an inclusive sum of 10*s*. per annum. This charge amply covers management expenses, purchase of fencing, the buying of utensils, etc., for the joint use of members.

A very desirable and effective form of fencing, namely, cleft chestnut, was selected and put up by the members in their leisure time. Apart from the fencing, a tool-house, eight barrows, two pairs of scales, and other requirements were obtained collectively during the first year.

Although the Urmston men had foremost in their minds the aim of producing payable crops from their ground, they did not allow this desire to overrule all others. They determined that so far as was possible their allotments should be convenient and comfortable to work, and pleasing to look upon; that they should have educational and recreative as well as more material uses. Therefore the Committee did not attempt to extract rent from every available inch of land. They planned out cartways 9 ft. wide, giving easy access for manure, etc., to every plot; and they left a large central plot unallotted to be held as the joint property of all the members and utilised for experimental or charitable purposes.

Rapid Progress.—It is a delusion often found among novices that ordinary ground takes a long time to get into decent order, and that it is an expensive business. A body of enlightened and energetic men working together, however, can do wonderful things. They did them at Urmston. The ground was only broken up in March, 1916, but in the same season splendid crops of peas, potatoes, and other vegetables were raised by the holders, the majority of whom had little or no previous experience of gardening.

So marked was the success of the venture from the outset that the area of the land originally acquired was soon found too restricted for the number of applicants, and three other fields have now been rented and developed. About 10 acres in all, at an average rent of £3 per acre, are now occupied by 160 active or working tenant-members holding land from the Association.

The Association has recently decided to encourage gardeners and allotment holders who have other land to become "associates" by the payment of an annual subscription of 1s. Strict membership will therefore be confined to tenants, but associates will have the same privileges for trading, buying seeds, etc., and already about one hundred associates have signed on.

Better Business.—In order that the main needs of the members may be dealt with co-operatively in the most effective and systematic manner, a Trading Committee was appointed to advise and make contracts, etc., on behalf of members.

Considerable economy in time and money was speedily effected by this arrangement. To ensure a cheap regular supply of manure for each member a contract was entered into by the Association with the local industrial co-operative society, which undertook to deliver its whole manurial output to the Association.

Lime, salt, and artificial manures have also been ordered collectively; and arrangements have been made with seedsmen and dealers for the supply at liberal discount terms for small seeds and other gardening requisites. Large quantities of seedlings and plants were bought and distributed at prices far below those at which single buyers would have been able to obtain them. Over 800 fruit trees and bushes were purchased and planted in the first year.

Enlightened Co-operation.—The Urmston Association has done good service by allying itself with the Board of Agriculture and Fisheries in the fight against wart disease of potatoes, which in many parts of the country (and notably around Manchester) has presented enormous difficulties to the professional and amateur gardener alike. Orders were placed by the Association for upwards of three tons of Scottish seed potatoes only of " disease resisting " or " immune " varieties; and leaflets and posters obtained from the Board were distributed among the members and other gardeners likely to be interested.

Samples of the soil of the allotments were sent for analysis to the Agricultural College, at Holmes Chapel, Cheshire; and the information derived from the investigations of the Principal and his assistants proved instructive and valuable to the members when considering the problem of liming, the use of artificials, and so on.

In addition to the work on the experimental plot there has been a certain amount of educational effort through the medium of literature and lectures, and this side of the Association's activities doubtless will be extended with the progress of time.

Sub-Committees.—Besides the Trading Committee various sub-committees were appointed, namely:—

1. *Development and Maintenance.*—This Committee is entrusted with the making and care of the roads and property of the Association, such as fences, tool-house, barrows, etc.

2. *Cultivation.*—The care and control of the common or Association plot is in the hands of this Committee, as also the plots of members serving in the Army or Navy.

3. *Inspection.*—This Committee deals with the observances of the by-laws, which are well drawn up and comprehensive, and seem likely to cover any difficulties that may arise. They comprise the power of dealing with unsatisfactory tenants, a matter which has often caused much difficulty on allotments where each plot is rented separately from the landlord or local authority, or where the Association has been lax in control.

Artistic Allotments.—Everybody has seen allotments with unsightly fences and other ugly erections, and a generally unkempt appearance. The Urmston men do not intend to allow their allotments to degenerate into a public eyesore. Members are asked to reserve the ends of their plots abutting on to the roads for the planting of flowers. This point in itself is significant of the new spirit with which allotment gardening has been taken up, especially in the northern counties.

Results—Financial and Otherwise.—At the end of the first year the Urmston Association issued a balance-sheet showing that from a total income of £112, after meeting all charges and after allowing 20 per cent. for depreciation, assets to the value of about £30 remained the property of the Association. The figures suggest that well-conducted allotment associations, under average conditions, can quickly be placed on a satisfactory basis as to cropping, and also as to finance.

In the opinion of its promoters, however, the Urmston experiment would be misjudged if it were judged only from these two points of view. They attach much importance to the neighbourly feeling which has grown up alongside the friendly emulation of these amateur gardeners. They point out that "the advantages of co-operation are not confined to economy in time and money, for the common interest that binds all members to seek the success of the Association, also provides the means of developing and utilising the individual talents of the members for communal and national purposes." In this connection it should be mentioned that amongst the latest activities of the Association is the formation of a prosperous branch of the National War Savings Committee.

Copies of this article may be obtained free on application, from the Secretary, Agricultural Organisation Society, Queen Anne's Chambers, Tothill Street, Westminster, London, S.W. 1.

Poisoning of Cattle by Ragwort.

THE following Note has been prepared by the Board's Chief Veterinary Officer: It is not generally recognised that the common British Ragwort (*Senecio Jacobæa*, L.) is poisonous to cattle. This probably arises from the fact that poisoning under natural conditions is a slow process, that is to say, an animal does not receive, and could not eat enough of the weed at one meal to cause acute poisoning. On the other hand, the poison is cumulative in its action; with continuous doses the amount of poison which becomes available is sufficient in time to cause very serious symptoms which often end in death.

Much more attention has been given to the subject of poisoning by certain species of ragwort in South Africa, Canada, and New Zealand, and in certain districts where it is commonly met with it was believed to be a disease of cattle until its actual cause was discovered. Thus, we find such names applied to it as Pictou, Winton, and Molteno disease. The following represent broadly the circumstances of the cases which have recently come to the notice of the Board. Pastures containing a considerable proportion of the weed were cropped in the hope that the comparatively early cropping might help to get rid of it. The crop was made into hay, and, owing to the prolonged spell of cold weather and the scarcity of other feeding stuffs, this was fed later and in considerable amount to animals at pasture.

Poisonous Principle.—The actively poisonous agent in the plant seems to be one or more alkaloids which have been extracted in more or less pure form from various species of ragwort.

Symptoms.—As might be expected from what has previously been said, the onset of poisoning is insidious. In the cases which have recently been inquired into at the Board's Laboratory it was not possible to say definitely what quantity of ragwort had been consumed by the animals before symptoms of illness became visible, as the dried forage containing the weed had been simply dumped on the pastures, and the cattle allowed to partake of it at will. The feeding, however, in one instance, was known to have begun on the 21st February, and continued until the 17th April, *i.e.* 55 days. The animals were then changed to other pastures, and feeding on the forage, which by this time was under suspicion, was discontinued. The first visibly affected animal was noticed on 6th April, *i.e.* 44 days after feeding on ragwort commenced. The time

which elapsed between the first appearance of definite symptoms and death varied from a few days up to a month. Some of the animals died in a few days after the first appearance of definite symptoms. In others the symptoms continued for a month or more and deaths occurred at the later dates. It would appear also that, although animals which have received a toxic amount of ragwort over a certain period may seem healthy at the time when feeding on the material is discontinued, they may nevertheless develop active symptoms of poisoning, and die at a later period. Thus, in the cases which have been investigated, some of the animals did not show definite symptoms until twelve days or more after the feeding with ragwort had been discontinued.

In the early stages the animals have the appearance of being hide-bound. Later they walk with a staggering gait, some appearing to be partially blind or heedless of where they go. Later they may become very excitable, and will charge at anyone who approaches them. In some there may be diarrhœa, but usually constipation is so marked that it causes violent straining. The pulse is weak and rapid, but the temperature remains normal.

Post-mortem Appearances.—When death takes place in the earlier stages of poisoning the principal lesions found are inflammation of the mucous membrane of the bowel. The omentum is dropsical. Small hæmorrhages are present under the mucous membrane of the bowel and in the serous covering of the heart (pericardium). In acute cases the liver is firmer than normal and yellow in colour, the yellow colour apparently arising from fatty degeneration of the liver cells. In chronic cases the liver is very hard owing to an increase of the fibrous tissue of the organ (cirrhosis of the liver), and in such cases the abdominal cavity contains fluid. This is not unlike what is seen in some animals affected with fluke disease. The lungs are congested.

Prevention.—There is no cure, and prevention resolves itself into removing the ragwort from the forage or eradicating it from the pastures.

In the *Journal of the Department of Agriculture and Technical Instruction for Ireland** McGovern makes the following recommendations in relation to the eradication of the weed :—

" Ragwort may be exterminated by preventing the plant from seeding. This may be done in the following ways :—

(*a*) " By grazing infested land with sheep in the winter and early spring ;

* Vol. XVI, 1916, p. 411.

(*b*) " By cutting the plants in the flowering stage either—

(i.) " Twice, the first cut being made early in July, and the second about six weeks later, there being no necessity to gather up the cut portions ; or,

(ii.) " Once only, cutting being done late in July or early in August. The cut portions of the plants must be gathered up at once and be destroyed by burning.

(*c*) " By pulling the plants if circumstances permit, preferably early in July, when there is no need to collect and burn the pulled plants. If pulled later the plants must be collected and burned to prevent seeding.

" It is most important to remember that since ragwort is a biennial plant it is absolutely necessary on pasture land to carry out cutting or pulling during two successive seasons.

" It is clear that in addition to the two-year-old flowering individuals present in a given summer there must also be a crop of one-year-old plants still in the rosette stage which will produce their flowering stalks during the second summer.

" Further, since it is practically certain that the seeds of ragwort, like those of charlock, poppy, and some other plants, may lie buried in the soil (although still retaining their vitality) for some time, it must be remembered that any farming operations which may bring these seeds to the surface will result in their germination, and a crop of ragwort derived from such seed is not an infrequent occurrence on land newly laid down in grass.

" Finally, owing to the ease with which the seed of ragwort is distributed by the wind the re-seeding of land temporarily cleared of it is an easy matter when the plant is allowed to flourish and produce its seeds on neighbouring land. There is, therefore, the strongest reason for scheduling this plant as a noxious weed all over the country, and for throwing the responsibility for its eradication on the shoulders of all those who possess or occupy land."

Recommendation (*a*) does not necessarily mean that sheep are immune to poisoning by ragwort, although this is a somewhat general belief. On the other hand there is reason to think that the flowering season—June, July and early August —is the time when ragwort is most actively poisonous. The question of whether flowering ragwort is poisonous to sheep is now being investigated at the Board's Laboratory.

Having regard to the experience acquired in practice of grazing sheep on ragwort pastures during the winter and early months of the year, it would seem reasonable to assume that

that practice is not attended by bad results. It may be, however, that sheep grazed, even for a comparatively short period, on ragwort receive damage to important organs like the liver.

Economical Feeding of Pigs.

IN view of the serious shortage of concentrated feeding-stuffs it is necessary at once to consider how best to apportion the available supplies among the different classes of farm animals. The production of human food by the feeding of animals must at present be considered a wasteful process, except in so far as it involves the conversion of material not suitable for human sustenance. Considered from this standpoint, how does the pig compare with other animals ?

Hitherto pigs have been fed very largely on materials most of which in one form or another are fit for human consumption. Experience shows that it takes about 7 lb. of concentrated food to produce 1 lb. of pork or bacon, whilst it is estimated that on the average only about 2 lb. of concentrated food (in addition to roots and straw) are consumed in the production of 1 lb. of beef or mutton. Furthermore, 7 lb. of cereals will make about 5 lb. of flour or 7½ lb. of bread ; and 1 lb. of cereals is of greater feeding value than 1 lb. of meat. It is clear, therefore, that the feeding of pigs on foods suitable for human consumption is not at the present time in the national interest. They must be restricted as far as possible to foods which cannot be used for human beings, such as grass, roots, silage, the coarser milling offals, damaged grain, fish meal, dried yeast, dried grains, malt culms, oil-cakes and extracted oil-cake meals, and waste products such as whey and town and household refuse.

Grazing.—Wherever possible, pigs should be turned out to pasture. The growing of special forage crops for folding with pigs or for " soiling " is not to be recommended at present in view of the necessity of using arable land for the cultivation of cereals. Clover, lucerne or ordinary pasture will provide the best grazing crops for pigs under present circumstances. In grazing lucerne care must be taken not to overstock it. The number of animals should be regulated to allow two or three cuttings yearly. Over-pasturing without mowing injures the crowns of the lucerne plants. The cut lucerne may be made into hay and fed to pigs during the winter along with other foods. Pig-grazing might be more generally practised in standard orchards.

Green food alone will not as a rule fatten pigs, but it will keep them in healthy growing condition and save a great deal of

meal. With a few weeks of sty-feeding on concentrated food at the end of the grazing period prime bacon can be produced. Barren sows have actually been fattened on good pasture without any supplementary foods, and palatable pork can also be produced under the same conditions. It is necessary that pigs should be accustomed gradually to the out-door life.

Before turning pigs on to pasture they should be ringed. They may be folded or allowed to run at large. Folds should not be too small or the pigs tend to deposit their manure mainly on the boundaries.

Fencing is of course a difficulty at the present time ; it may, however, be worth mentioning that, in the event of pigs " nosing " under a fence, a barbed wire fixed close to the ground will prove a sure deterrent. Two strands of barbed wire fixed 6 in. and 15 in. respectively from the ground will effectually confine all pigs. Hurdles are suitable for folding.

Breeding Stock.—The reduction in the number of pigs which is necessary to meet the present abnormal conditions must not be allowed to endanger the future of the breeds, and an adequate nucleus should be retained to ensure the re-establishment of the pig industry after the war. No hard and fast rules can be laid down for the guidance of pig-keepers in selecting a suitable type for grazing. Pedigree stock of probably all the breeds will soon adapt themselves to an out-door life, but for general purposes a good quality sow of the local breed, crossed with a boar of an early-maturing breed such as the Middle White will usually prove satisfactory.

As a general rule in-pig sows and gilts may be turned out to pasture from April to October, and given only a minimum of concentrated food. If the pasture is a good one no supplementary food may be required. In the winter months they may be allowed to run out in paddocks with access to shelter up to within a few weeks of farrowing. Shelter may consist of cheap erections made of wood faggots and hurdles stuffed with straw. If possible, access should be given to mature woods. The animals will continue to find a considerable proportion of their food on the pasture and in the woods, especially if the latter contain an appreciable number of nut-bearing trees and edible plants. In addition, mangolds or other roots should be supplied and a pound or two per head per day of beans or their equivalent.

Farrowing should be regulated so as to occur not later than July with the second litter coming about January. The first litter could then be disposed of for slaughter in the autumn

without necessitating the use of any appreciable quantity of concentrated food. As a rule sows should be brought home to farrow. During the suckling period the food may consist largely of succulent herbage, roots, waste potatoes, silage and chaffed clover or lucerne with the addition of about 3 lb. of concentrated food. The condition of the sow should determine whether more than this amount of concentrated food is given. Roots, potatoes and chaff should be boiled or steamed, and to this should be added some milling offals or finely ground oil-cake at the rate of about 1 lb. of the concentrated food to 10 lb. of roots or similar food.

Feeding of Store Pigs.—Young pigs should still receive a moderate allowance of meal during weaning. When they have reached the age of 10 weeks they should be encouraged to find most of their food out-of-doors. It may be necessary that pig-feeders should cater chiefly for the pork market. Cases are known where porkers sold off pasture have made good prices in the London market without the aid of any concentrated food; as a rule, however, about 1 lb. per head per day on the average should be allowed. For the production of bacon, pigs should, during the last two or three weeks, be prepared for slaughter mainly on concentrated food.

In the case of sty-fed pigs the aim should be to produce pork rather than bacon. In the winter months, if possible, pigs should be allowed to run in the yards with bullocks. In addition to "gleanings" found there they should receive a mixture of boiled roots or waste potatoes with a very little of the coarser offals, say 1 lb. of offals to 10 lb. of roots or similar food.

Consumers generally must be content with a lower standard of "finish" than has been customary hitherto.

Advantages of the Out-door System.—Under this system it is found that:—

(1) A great saving of meal is effected.
(2) Breeding sows are more prolific and much hardier than those kept in sties.
(3) The young are bigger and hardier than sty-bred pigs.
(4) Pasture is improved by pig-grazing.
(5) Valuable food materials such as acorns, which are often wasted, are turned to useful account.

Relative Value of Feeding Stuffs.—As a guide in the selection of supplementary foods for pig-feeding the following figures, mainly based on the practical feeding trials of Hansson, may prove useful. They are given for the general guidance of the

pig-feeder in considering how foods previously used and now to be excluded can best be replaced. As already indicated, no food suitable for human beings should now be given to pigs. Most of the figures relate only to dairy cows, but on the whole, they may also be considered fairly reliable for other classes of stock :—

	Lb. of Food equal to 10 lb. of Barley.		*Lb. of Food equal to 10 lb. of Barley.*
*Barley	10	*Separated milk ..	60
Wheat	10	Butter milk	60
Oats	12	Whey	120
*Maize	9½	Mangolds	90
Peas	10	Carrots	80
Beans	10	Swedes	100
Earthnut cake ..	8	Turnips	125
Linseed cake ..	9	*Potatoes	40
Coconut cake ..	9	Clover hay	22
Palmnut cake ..	10	Lucerne hay	25
Wheat bran ..	12	Green clover	70
Gluten feed	9½	Green lucerne	75
Dried yeast	8	Pasture grass	63
Dried grains ..	13	Silage (oat and vetch)	100
Malt culms	13		

* Confirmed in experiments with pigs conducted by the Department of Agriculture and Technical Instruction for Ireland.

NOTE.—*This article may be obtained in the form of Bulletin No. 9, Series C, from the Secretary, Food Production Department, 72, Victoria Street, London, S.W. 1.*

THE following Note has been communicated to the Board by Mr. A. Harbord, of Friningham, near Maidstone :—

Grazing of Pigs in Kent.

As a result of years of breeding and selection, the writer has obtained a strain of pigs which is noted for its hardihood and for being able to pick up a living where other animals might be expected to starve. Though the grazing grounds are in a most exposed position, 650 ft. above sea level, the pigs are wintered out of doors with only the roughest kind of shelter shed for protection, and further, they are only given very limited amounts of concentrated food, *i.e.* not more than 1 to 1½ lb. per head per day, this being mixed with a little hay and pulped roots. Nevertheless, practically all these special grazing pigs maintain themselves in a healthy thriving condition, and in the summer and early autumn can be drawn direct from the best pastures for the butcher ; as an example of what they can achieve, the record of one of the breeding sows for the year 1915–1916 is given below.

During the autumn of 1915 the sow lived on rough pasture and underwood where there were a few acorns and beech nuts to pick up, and just for a few weeks before farrowing, when the weather was bad, she received in addition an allowance of ½ lb. of maize and 1 lb. of meal per day. She farrowed on 14th December, and was then fed on middlings till 7th February, when her 10 small pigs were weaned. Afterwards she was put to the boar again, and turned out with the allowance of 1½ lb. of concentrated food per day as before. In April, the meal and maize were discontinued and the sow, together with 17 other pigs was put on to a 5-acre field of good pasture where she remained till she farrowed again in June. The second litter of 11 young and the mother were fed on middlings until the piglets were sold at 7 weeks old, and then the sow was served and returned to the 5-acre pasture, receiving no concentrated food till September and only small amounts after that. She farrowed a third time on 24th November, yielding a fine, level, strong litter of 10 pigs.

In reckoning the cost of keeping pigs on this system of management the writer makes no allowance for labour, estimating that the cost of labour is more than compensated for by the value of the manure left and by the improvement of the pasture. In any case the cost of labour would be very small as one man did all the work, except the carting, for a herd of 200 pigs.

The 5-acre pasture not only supplied grazing for 18 pigs during 7 months but was also run over by sheep on several occasions. Putting the rent and rates of the field at £10, and deducting the amount received for the grazing of the sheep at the rate of 4*s.* per score per week, the cost of grazing the pigs works out at the rate of 4*d.* per head per week. With regard to the concentrated food, £11 a ton was paid for the middlings and £8 for the meal. On this basis, the writer estimates that the total cost of keeping the sow and her three litters from December, 1915, to December, 1916, was £30. Against this he places the following returns :—

	£	*s.*	*d.*
1st Litter—			
3 gilts sold July, 1916	25	4	0
4 hogs ,, October ,, ...	30	2	6
3 gilts valued ,, ,, ...	30	0	0
2nd Litter—			
11 piglets sold July, 1916	15	10	0
3rd Litter—			
10 piglets valued December, 1916 ..	10	10	0
Total	111	6	6

According to these figures it is evident that the sow in question yielded a very handsome profit, and even admitting that in an average year the sow would only produce 2 litters, the returns would still be highly satisfactory.

Notes on Feeding Stuffs for August: *From the Animal Nutrition Institute, Cambridge University.*

CHANGES in price since last month are most irregular. A few articles have remained at last month's prices, for instance, feeding barley, English-made linseed cake, and Bombay cotton cake. Other cakes, except coconut cake, are slightly cheaper. Millers offals are also appreciably cheaper and there is at present a good supply. Dried grains, malt culms, maize, beans and peas are all dearer.

A quotation for boiled linseed oil was included in Table I. last month. This was an error, boiled oil not being suitable for feeding.

Horses.—The season approaches when it will be necessary to provide an extra ration of concentrated food for the horses in order that they may be fit for the heavy work which harvest operations entail. The cheapest foods on the market which are suitable for horses are bran, pollards and palm kernel cake, which may replace oats in the following proportions :—

Ten lb. oats may be replaced by 14 lb. bran, 10 lb. pollards, or 8 lb. palm kernel cake. Of palm kernel cake for horses we have no personal experience, but reports are to hand of its successful use. A ration of 5 lb. of pollards, or 7 lb. of bran, and 4 lb. of palm kernel cake might be tried as a substitute for 10 lb. of oats. Or a mixture of 5 lb. of oats with half the above quantities. Owners should introduce the palm kernel cake gradually.

Milking Cows.—Now is the time when cowkeepers should watch their grass. As soon as signs appear of the grass failing, the cows should be given extra food in order to keep up the milk yield, for cows in full milk seldom recover from a check caused by defective feeding in August and September. Green crops should be used where they are available, and a concentrated ration may also be necessary. Bran or pollards, ground nut cake where it can be bought, palm kernel cake, and linseed cake are the cheapest foods suitable for this purpose at present prices. Needless to say they should be used in the smallest quantity which will suffice for the purpose in view.

Cattle for Beef Production.—Since older cattle are known to fatten better than young stock on roots and straw, and since it is not likely that cake will be available for beef production in the coming winter, graziers should push on their younger stores for slaughter before the grass fails, leaving the older cattle for stall feeding.

A moderate ration, say 3–4 lb. of cake per day, will produce more beef if fed now to young cattle for slaughter in the autumn

TABLE I.

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of June.											
		London.		Liverpool.		Hull.		Bristol.		Glasgow.		Leith.	
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.	
Soya Bean Cake	122·3	—		—		—		—		—		—	
Decorticated Cotton Cake	126·3	21 0 0		—		—		—		—		—	
London-made Cotton Cake	71·9	16 0 0		—		—		—		—		—	
Decorticated Cotton Meal	126·3	—		—		—		—		—		—	
Decorticated Cotton Cake, American	126·3	—		21 15 0		—		—		—		—	
Indian Linseed Cake	123·1	21 0 0		21 5 0		—		—		21 10 0		21 10 0	
Russian Linseed Cake	123·5	—		—		—		—		—		—	
English Linseed Cake	120·1	21 5 0		21 10 0		20 10 0		—		22 0 0		21 15 0	
Bombay Cotton Cake	65·3	—		16 10 0		—		—		—		—	
Egyptian Cotton Cake	71·9	15 12½ 6		17 5 0		15 10 0		—		16 10 0		16 5 0	
Coconut Cake	102·6	18 5 0		—		—		—		—		—	
Palm Kernel Cake	96·1	—		16 5 0		14 17 6		—		17 10 0		17 10 0	
Palm Kernel Meal (extracted)	92·5	—		—		—		—		—		—	
Ground-nut Cake	145·2	Nominal		—		17 12 6		—		—		—	
English Beans	99·5	21 9 5		22 17 4		22 12 7		—		—		—	
Bean Meal	99·5	—		—		—		—		25 0 0		—	
Chinese Beans	101·2	Nominal		—		—		—		—		—	
English Maple Peas	97·2	22 4 5		—		31 2 2		—		—		—	
English Dun Peas	97·2	21 11 1		—		24 8 10		—		—		—	
Calcutta White Peas	97·5	Nominal		—		—		—		—		—	
American Maize	93·8	16 6 8		—		—		—		—		—	
Argentine Maize	94·2	17 10 0		—		—		21 0 0		—		—	
Maize Meal	86·5	20 0 0		—		—		—		—		—	
Maize Gluten Feed	121·6	19 0 0		19 12 6		—		19 0 0		—		—	
Maize Germ Meal	99·2	19 10 0		—		—		—		—		—	
English Feeding Barley	83·0	18 4 0		—		16 16 0		—		—		—	
English Oats	75·4	19 15 0		—		19 15 0		*23 6 8		—		—	
Argentine Oats	75·4	23 11 6		—		—		—		—		—	
Malt Culms	69·9	13 12 6 (Ale).		—		14 0 0		—		15 10 0		16 0 0	
Brewers' Grains (dried)	84·5	18 0 0 (Ale).		—		15 15 0		—		—		—	
Brewers' Grains (wet)	21·1	2 12 9		—		2 0 0		—		—		—	
Distillers' Grains (English)	101·2	18 5 0		—		—		—		—		—	
Distillers' Grains (French)	101·2	18 5 0		—		—		—		—		17 0 0	
Distillery Mixed Grains (wet)	20·0	—		—		—		—		—		—	
Egyptian Rice Meal	78·7	Nominal.		—		—		—		—		—	
Burmese Rice Meal	78·7	Nominal.		—		—		—		—		—	
Rice Bran	78·7	—		—		—		—		—		—	
Wheat Middlings (coarse)	94·8	15 0 0		—		14 10 0		—		16 10 0		15 5 0	
Wheat Sharps	90·5	15 5 0		15 0 0		14 10 0		14 10 0		15 10 0		14 5 0	
Wheat Pollards	96·7	—		14 5 0		—		—		—		—	
Wheat Bran	77·5	13 0 0		—		13 5 0		12 10 0		15 0 0		14 0 0	
Wheat Bran (broad)	79·9	14 0 0		14 5 0		15 5 0		13 10 0		15 10 0		14 15 0	
Feeding Treacle	60·0	Nominal.		22 10 0		—		—		—		27 10 0	
Linseed	153·5	30 0 0		—		30 0 0		35 0 0		—		*32 10 0	
Linseed Oil	250·0	58 0 0		†60 0 0		54 15 0		—		—		—	
Egyptian Cotton Seed	108·6	19 0 0		—		19 0 0		—		—		—	
Bombay Cotton Seed	99·6	—		—		—		—		—		—	
Cotton Seed Oil	250·0	—		73 0 0		—		—		—		—	
Fish Meal	145·0	—		—		—		—		17 0 0		16 0 0	
Locust Bean Meal	80·0	—		—		—		—		—		—	

* Crushed. † In barrels.

than if kept for stall feeding in the winter. The cheapest cakes at the present time are ground nut (not always available) palm kernel, decorticated cotton, and linseed.

Sheep.—Ewes should not be put with the ram until about Michaelmas, so that the lambing season may be deferred until

TABLE II.

LONDON. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	5½	Linseed	3	11
Maize gluten feed ..	3	1¾	Malt culms	3	11
Wheat middlings ..	3	2	Maize germ meal ..	3	11¾
Decorticated cotton cake	3	3¾	Brewers' grains (dried) ..	4	3¼
Wheat bran	3	4¼	English beans	4	3¾
Wheat sharps	3	4½	Egyptian cotton cake ..	4	4¼
Indian linseed cake ..	3	5	English feeding barley ..	4	4½
American maize ..	3	5¾	English dun peas ..	4	5¼
Wheat bran (broad) ..	3	6	London-made cotton cake	4	5½
Cotton seed	3	6	English maple peas ..	4	6¾
Coconut cake	3	6½	Maize meal	4	7½
English linseed cake ..	3	6½	Linseed oil	4	7¾
Distillers' grains (English)	3	7¼	English oats	5	0½
Distillers' grains (French)	3	7¼	Argentine oats	6	2¾
Argentine maize.. ..	3	8½			

TABLE III.

LIVERPOOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Wheat pollards	2	11½	Wheat bran (broad) ..	3	7
Maize gluten feed ..	3	2¾	English beans	4	7
Wheat sharps	3	3¾	Linseed oil	4	9½
Palm nut cake	3	4½	Egyptian cotton cake ..	4	9½
Indian linseed cake ..	3	5½	Bombay cotton cake ..	5	0½
American linseed cake ..	3	5½	Cotton seed oil	5	10
English linseed cake ..	3	7	Feeding treacle	7	6

TABLE IV.

HULL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	1	11	Linseed	3	11
Ground nut cake ..	2	5	Malt culms	4	0¼
Wheat middlings ..	3	0¾	English feeding barley ..	4	0½
Palm nut cake	3	1	Egyptian cotton cake ..	4	4
Wheat sharps	3	2½	Linseed oil	4	4½
English linseed cake ..	3	5	English beans	4	6½
Wheat bran	3	5¼	English dun peas ..	5	0¼
Cotton seed	3	6	English oats	5	0½
Brewers' grains (dried) ..	3	8¾	English maple peas ..	6	5
Wheat bran (broad) ..	3	10			

TABLE V.

BRISTOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	3	1¾	Argentine maize ..	4	5½
Wheat sharps	3	2½	Linseed	4	6¾
Wheat bran	3	2¾	English oats	6	2¼
Wheat bran (broad) ..	3	4½			

TABLE VI.

AVERAGE PRICES PER FOOD UNIT.

LONDON, LIVERPOOL, HULL AND BRISTOL.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	2¼	Malt culms	3	11½
Ground nut cake ..	2	5	Maize germ meal ..	3	11¾
Wheat pollards	2	11½	Brewers' grains (dried) ..	4	0
Wheat middlings ..	3	1½	Argentine maize ..	4	1
Maize gluten feed ..	3	2	Linseed	4	1½
Palm nut cake	3	2¾	English feeding barley ..	4	2½
Wheat sharps	3	3¼	London-made cotton cake	4	5½
Decorticated cotton cake	3	3¾	English beans	4	5¾
Wheat bran	3	4	Egyptian cotton cake ..	4	6
Indian linseed cake ..	3	5¼	Linseed oil	4	7¼
American cotton cake ..	3	5½	Maize meal	4	7½
American maize	3	5¾	English dun peas ..	4	8¾
English linseed cake ..	3	6	Bombay cotton cake ..	5	0½
Cotton seed	3	6	English maple peas ..	5	6
Coconut cake	3	6½	English oats	5	7½
Wheat bran (broad) ..	3	6¾	Cotton seed oil	5	10
Distillers' grains (English)	3	7¼	Argentine oats	6	2¾
Distillers' grains (French)	3	7¼	Feeding treacle	7	6

TABLE VII.

GLASGOW. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	4¼	Wheat bran	3	10½
Wheat sharps	3	5¼	Wheat bran (broad) ..	3	10½
Wheat middlings ..	3	5¾	Malt culms	4	5¼
Indian linseed cake ..	3	6	Egyptian cotton cake ..	4	7¼
Palm kernel cake ..	3	7¾	Bean meal	5	0¼
English linseed cake ..	3	8			

TABLE VIII.

LEITH. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	2½	Wheat bran	3	7½
Wheat sharps	3	2	Palm kernel cake ..	3	7¾
Wheat middlings ..	3	2¾	Wheat bran (broad) ..	3	8¼
Distillery mixed grains			Linseed (crushed) ..	4	2¾
(dried)	3	4½	Egyptian cotton cake ..	4	6¼
Indian linseed cake ..	3	6	Malt culms	4	7
English linseed cake ..	3	7½	Feeding treacle	9	0

TABLE IX.

AVERAGE PRICES PER FOOD UNIT.

GLASGOW AND LEITH.

	s.	d.		s.	d.
Fish meal	2	3½	Palm kernel cake ..	3	7¾
Wheat sharps	3	3½	Wheat bran	3	9
Wheat middlings ..	3	4¼	Linseed (crushed) ..	4	2¾
Distillery mixed grains (dried)	3	4½	Malt culms	4	6
Indian linseed cake ..	3	6	Egyptian cotton cake ..	4	6¾
Wheat bran (broad) ..	3	6½	Bean meal	5	0¼
English linseed cake ..	3	7¾	Feeding treacle	9	0

TABLE X.

(1) Name of Feeding Stuff.	(2) Nutritive Ratio.	(3) Per cent. digestible. Protein.	(4) Per cent. digestible. Fat.	(5) Per cent. digestible. Carbo-hydrates and Fibre.	(6) Starch equiv. per 100 lb.	(7) Linseed Cake equiv. per 100 lb.
Foods Rich in both Protein and Oil or Fat.						
Ground nut cake	1 : 0·8	45·2	6·3	21·1	77·5	102
Soya bean cake	1 : 1·1	34·0	6·5	21·0	66·7	88
Decort. cotton cake ..	1 : 1·2	34·0	8·5	20·0	71·0	93
Linseed cake, Indian ..	1 : 1·9	27·8	9·3	30·1	77·1	101
Linseed cake, English ..	1 : 2·0	26·7	9·3	30·1	76·0	100
Cotton cake, Egyptian ..	1 : 2·1	15·5	5·3	20·0	40·0	53
Cotton cake, Bombay ..	1 : 2·5	13·1	4·4	21·5	37·6	49
Distillers' grains (English) / Distillers' grains (French)	1 : 2·9	18·7	10·2	29·0	57·3	75
Maize gluten feed	1 : 3·0	20·4	8·8	48·4	87·4	115
Brewers' grains, dried ..	1 : 3·5	14·1	6·6	32·7	50·3	66
Coconut cake	1 : 3·8	16·3	8·2	41·4	76·5	101
Palm kernel cake	1 : 4·5	14·1	6·1	48·9	76·7	101
Linseed	1 : 5·9	18·1	34·7	20·1	119·2	157
Bombay cotton seed ..	1 : 6·6	11·0	16·8	30·1	77·5	102
Fairly Rich in Protein, Rich in Oil.						
Maize germ meal	1 : 8·5	9·0	6·2	61·2	81·0	107
Rice meal	1 : 9·4	6·8	10·2	38·2	68·4	90
Rich in Protein, Poor in Oil.						
Fish meal	1 : 0·1	54·0	4·0	—	60·0	78
Peas, Calcutta white ..	1 : 2·1	23·3	1·1	45·9	66·9	88
Beans, English	1 : 2·6	19·3	1·2	48·2	67·0	88
Beans, Chinese	1 : 2·6	19·6	1·7	47·9	67·0	88
Peas, English maple ..	1 : 3·1	17·0	1·0	50·0	70·0	92
Palm-nut meal (extracted)	1 : 3·4	15·6	1·9	48·7	66·1	87
Brewers' grains, wet ..	1 : 3·5	3·5	1·5	8·6	12·7	17
Malt culms	1 : 3·6	11·4	1·1	38·6	38·7	51
Cereals, Rich in Starch, not Rich in Protein or Oil.						
Barley, feeding	1 : 8·0	8·0	2·1	57·8	67·9	89
Oats, English	1 : 8·0	7·2	4·0	47·4	59·7	79
Oats, Argentine	1 : 8·0	7·2	4·0	47·4	59·7	79
Maize, American	1 : 11·5	6·7	4·5	65·8	81·0	107
Maize, Argentine	1 : 11·3	6·8	4·5	65·8	83·5	110
Maize meal	1 : 13·0	5·5	3·5	63·9	77·8	102
Wheat middlings, fine ..	1 : 4·8	13·2	3·0	53·8	72·0	95
Wheat middlings, coarse or sharps	1 : 5·1	13·8	4·3	50·5	64·0	84
Wheat pollards	1 : 4·5	11·6	4·0	51·6	60·0	79
Wheat bran	1 : 4·7	11·3	3·0	45·0	49·7	65
Wheat bran, broad ..	1 : 4·7	11·3	3·0	45·4	48·1	63
Locust bean meal	1 : 22·1	4·0	0·7	69·2	71·4	94

there is a prospect of keeping the ewes and lambs without the use of much concentrated food.

Lambs and tegs in forward condition will go back on roots in the winter unless they get a fair ration of cake, which it may be impossible to provide. Farmers who consider the future will look over their lambs and tegs, and pick out all those which promise to be ready for the butcher before Christmas. These should get a little cake now so that they may come to the butcher before the shortage of cake gets worse. Lambs and tegs which do not promise to be ready for slaughter by Christmas should be run as stores during the winter and fatted next summer, since they are not likely to fatten in the winter without more cake than will probably be available.

Shearings and cull ewes should be kept as stores until they go on to roots for the winter. They will put on flesh in the winter on roots if helped with whatever dry fodder may be available.

Pigs.—There is at present a fair supply of wheat offals, and there will no doubt be a certain amount of chats from the second early potatoes. It will hardly be possible to cook these on account of the coal shortage, but if sliced or pulped and mixed with an equal weight of a mixture of 5 parts of sharps or middlings and 1 part of palm kernel meal or cake, they should form a useful change for pigs which have been on grass or green stuff.

Notes on Poultry Feeding:
From the Harper Adams Agricultural College, Newport, Salop.

REDUCTION in the head of poultry has no doubt taken place during the past two or three months, and more may still be done in reducing unsatisfactory stock by disposing of two-year-old birds as soon as their laying season is over and moulting commences. A reduction in the younger stock could advantageously be made by a careful examination of all the birds in the flock. It is well known that flocks contain a number of birds which, though looking well, are not laying and not paying. A bird's capabilities as a layer can be determined at once by those who possess a knowledge of the particular features to look for and who handle the bird carefully, and if owners would use this knowledge a large number of useless and wasteful birds would be eliminated from the flock.

The problem of foodstuffs has not been solved, but it is the duty of all to preserve all such food as can be used for human consumption for that purpose. There are still obtainable supplies of damaged grain, screenings and tailings which under the Food Controller's Order of 16th April, 1917, should be obtainable at prices not exceeding those laid down for wheat, barley, and oats, of the 1916 crop. Hard grain is not an absolute necessity though a decidedly advantageous addition to the hen's ration. Cockled wheat is frequently offered and should be examined carefully before being fed to birds, as the true corn cockle seed is poisonous, whereas much that is sold as cockled wheat contains other seeds which may be safely fed to poultry. Oats and cracked maize fed sparingly make a useful "scratch mixture."

While very little opportunity occurs for variation and discretion in the hard food used, there are still many soft foodstuffs available for poultry. The principal meal available, and one which is being used as a basis in several compounded meals, is palm nut meal. In a series of trials carried out with palm nut meal, ground nut meal, etc., in various forms (sweetened and unsweetened, extracted), mixed and fed alone, it was found that all proved useful foodstuffs for poultry when fed with discretion. The common mistake is to make sudden changes and to feed too large quantities. The mixed meals should not at first contain more than 5 per cent. of such a food as palm nut meal, and the quantity can be gradually increased, say 5 per cent. every third day to a maximum of 25 per cent. In the trials referred to the sweetened foods did not prove as suitable as the unsweetened, a noticeable effect being produced by the former upon the quality of the yolk and flavour of the egg, and further, the birds did not take to the food so readily. The ration may commence with sharps 60 per cent., bran 30 per cent., fish meal 5 per cent., meal (under trial) 5 per cent.

At the present time of year, green food should form a valuable addition to the ration, and where birds have a free run they will make as full use of the green clover as they do of the dried form so frequently included in mixtures. Where lucerne, sainfoin, and similar plants are available, they can be profitably used.

Prices during the last month have shown an upward trend, and the cost will now work out to at least $3\frac{3}{4}d.$ per

head per week upon the following ration, with foods at the prices now ruling:—

Sharps	80 parts.
Bran	10 ,,
Palm kernel meal	25 ,,
Fish meal	15 ,,
Feed wheat	35 ,,

Feed per day, $4\frac{1}{3}$ oz. per head.

The present price of eggs is, however, such as to justify such a ration, since a return of two eggs per week would cover the cost of food, and any addition to this number would be reckoned as profit.

Foods on which Animals May and May Not be Fed.

THE Board have received inquiries as to the feeding stuffs on which farm animals may or may not be fed, and in particular as to "prohibited" foods. They therefore think it desirable to issue the following statement summarising the Orders now in force :—

Wheat, Rye and Rice.—Wheat, rye and rice, or flour prepared therefrom, must not be fed to any class of stock. This does not apply to tailings, screenings, or other material so damaged as to be unsaleable for milling. (*Statutory Rules and Orders*, 1917, No. 376.)*

Oats, Maize, Beans and Peas.—Oats, maize, beans and peas may be fed to horses without restriction only in the following cases :—

(1) Horses in the possession of the Army Council or the Admiralty, or exclusively used for the purposes of the Army Council or Admiralty.

(2) Horses maintained and used exclusively for agricultural purposes.

(3) Stallions used exclusively for stud purposes.

(4) Thoroughbred brood mares.

(5) All other brood mares in foal or with foal at foot.

For all other horses the following restrictions must be observed :—

(*a*) Horses, other than thoroughbreds, solely or mainly used for trade or business purposes must not receive more than certain specified rations of oats, maize, beans or peas.

* See *Journal*, May, 1917, p. 236.

(*b*) Thoroughbred horses not specifically excluded as above from restriction, must not receive more than certain maximum rations.

(*c*) No oats, maize, beans or peas must be given to any horse not included in the classes specified above.

The person or persons in possession of any horse falling within (*a*) or (*b*) must keep records of the oats, maize, beans and peas used for feeding such horse, and such records must at all reasonable times be open to the inspection of an officer of police or any other person authorised by the Food Controller. For horses to which the restrictions apply no other cereal foodstuff may be used except bran and dried brewers' grains. These may be used without restriction for the feeding of any horse. (*Statutory Rules and Orders*, 1917, No. 439.)*

For all other classes of stock the use of oats, maize, beans and peas is still permitted without restriction, but it is urgently necessary in the national interest that the use for stock-feeding of these foods should be reduced to the very narrowest limits possible, except in the case of material that is obviously unfit for human consumption.

Malt.—Malt must not be used for any purpose (apart from brewing for sale under certain conditions) except under the authority of the Food Controller. (*Statutory Rules and Orders*, 1917, No. 345.)

Chaffed Hay.—No chaffed or chopped hay must be manufactured, purchased, sold or delivered in Great Britain unless it contains not less than 20 per cent. of chopped straw. (*Army Council Order*, 9th May, 1917.)†

It may be stated briefly that the following feeding stuffs are:—

Allowed.§	*Forbidden.*	*Restricted.*‖
Wheat Offals.	Wheat.	Oats.
Gluten Feed.	Barley (imported or kiln-dried home-grown).‡	Maize.
Maize Germ Meal.		Beans.
Dried Grains.		Peas.
Malt Culms.	Rye.	Other cereal foodstuffs except bran and dried grains.
Oil Cake and Meals.	Rice.	
	Malt.	

* See *Journal*, June, 1917, p. 362. † See *id.*, p. 364. ‡ See *id.*, May, 1917, p. 235. § The list of foodstuffs under this heading is not intended to be exhaustive. ‖ May not be fed to certain classes of horses—see above.

Committee on the Production and Distribution of Milk: Interim Report. *

IN April of the present year, the President of the Board of Agriculture, by request of the Cabinet and with the concurrence of the Food Controller, appointed a Committee to report on "the production and distribution of milk, including the consideration of the steps which should be taken (1) to stimulate production, (2) to conserve milk supplies during any period of excess, (3) to provide for the special needs of children in urban centres, (4) to effect economies in the cost of production and distribution, (5) to organise supplies by administrative action so as to reach all sections of the community, and (6) other kindred subjects." The Committee are constituted as follows :—

Major the Hon. Waldorf Astor, M.P.	*Chairman.*
Mr. W. Anker Simmons	Ministry of Food.
Professor T. B. Wood	Board of Agriculture and Fisheries.
Sir Robert P. Wright	Board of Agriculture for Scotland.
Mr. J. R. Campbell, B.Sc.	Department of Agriculture and Technical Instruction for Ireland.
Dr. A. W. J. MacFadden, C.B. ..	Local Government Board, England.
Major Gerald R. Leighton, M.D. ..	Local Government Board, Scotland.
Mr. Dermod O'Brien, D.L.	Local Government Board, Ireland.
Mr. J. Mackintosh, *Secretary*	Food Production Department.

The Committee did not hold its first meeting till May 21st, having been instructed not to begin the consideration of the problems referred to until the Grosvenor House Committee had completed its work. This latter Committee had been appointed at the end of April by the Food Controller, under the chairmanship of Lord Somerleyton, to report "upon the effect of the existing Milk Order on the production and distribution of milk and the difficulties which had arisen in connection with the fixing of maximum prices, and to make recommendations to Lord Devonport as to the lines upon which any future Orders made by him should be framed." Their Report was published on 9th May.† It contained recommendations with regard to prices, and, with reference more particularly to

* [Cd. 8608]. Price 2*d*. Net.

† Report of the Advisory Committee . . . set up at a Conference held by the Food Controller on 19th April, 1917 . . .

production, some suggestions which are referred to and endorsed in the recommendations of the present Interim Report.

Milk, when compared with other animal foods, has been and is still one of the cheapest foods obtainable. Before the War, one shillingsworth of milk supplied more nutriment than could be purchased for the same money in the common cuts of beef, mutton, or pork, and twice as much as could be purchased in eggs or fish. Since the War, beef has risen in price 112 per cent., eggs 78 per cent., fish 138 per cent., and milk only 62 per cent. The Committee are not only impressed with the necessity of maintaining the existing supply of milk during the War, but are also of opinion that the total consumption might be increased considerably in the interests of the children of the country. The immediate problem being, however, to safeguard against a possible shortage of milk next winter, the Committee have accordingly, before investigating in any detail the larger questions of future policy, begun by devoting their immediate attention to considering what steps could be taken to prevent or diminish the above contingency. They are of opinion that there are three main directions in which action can be taken to meet this urgent problem :—

(*a*) The uncertainty and sense of insecurity which exists among dairy farmers, particularly in respect of prices, labour and feeding stuffs, should, as far as possible, be immediately reduced. To this end the Committee urge in the first place that the Food Controller announce as early as possible the milk price he proposes to fix for the remaining summer months and for next winter. Secondly, while recognising that some most valuable labour has been provided by newly-trained milkers, the Committee are of opinion that such labour cannot replace experienced cowmen and feeders and that cowkeepers should, therefore, be allowed to retain their skilled men. Thirdly, they recommend that in the distribution of cakes, millers' offals, etc., a preference should be given to dairy herds, and they hope that steps will be taken to see that dairy farmers maintain an adequate acreage of roots and forage crops.

(*b*) The surplus summer milk should be used to the best advantage, that is to say, the largest possible proportion should be converted into dried or condensed milk. The Committee believe that by working the existing plants and factories for the preparation of dried milk at their fullest capacity the total output might be increased by 50 per cent. Further, they recommend that the Food

Controller should consider the advisability of purchasing the whole supply of dried and condensed milk. The Committee also recommend (1) that the surplus milk which cannot be manufactured into dried or condensed milk should be used as far as possible for cheese rather than butter making, except where the skim or separated milk is consumed as human food; (2) that the use of milk in any form for the manufacture of milk chocolate, and that the sale of preserved cream should be prohibited; with regard to the use of Devonshire and Cornish cream, however, the Committee do not feel justified in recommending an immediate and total restriction, in view of the local difficulties of utilising this milk for other purposes and of the small quantity actually used.

(*c*) The loss of milk during the warm months of the year by waste or souring before it reaches the consumer should be reduced. The Committee are investigating the extent of this loss and the steps which might be taken to diminish or eliminate it.

Land Settlement for Discharged Soldiers in Ontario.*

THE Province of Ontario has now completed the arrangements for a land colonisation scheme by which discharged soldiers who have served with the British Forces are offered the opportunity of securing homes in New Ontario.

All men who wish to go upon the land will first be sent to an agricultural training depot where they will be provided with good board and living accommodation during their period of instruction, and where they will be paid a reasonable wage for work done. As soon as a sufficient number of trained men have accumulated, a Farm Colony will be established along the line of the railway. The Colony will be in charge of a competent superintendent, under whom the men will proceed to do whatever clearing may be necessary, erect the necessary buildings, and do such other work as may be essential to the establishment of a central community. The men will be housed and cared for in the central community, and paid a reasonable wage, and their labours will be directed to clearing and preparing for cultivation the land of the colony. Farms containing not more than 80 acres will be laid out in such manner as to bring the different farmhouses as close together as possible, and an area of 10 acres will be cleared on the front of each farm.

* *The Agricultural Gazette of Canada*, Vol. IV, p. 306, 1917.

As soon as a soldier desires to go upon a farm and work for himself, an 80-acre lot with a 10-acre clearing will be allotted to him. He will be supplied with the necessary machinery and tools, and such cattle, pigs, poultry, etc., as the competent authority may determine, up to the value of $500 (£104). The 80 acres, with 10 acres of clearing, will be given to the settler free of charge. For the advance of $500, made to cover the cost of stock, implements, equipment, and any assistance in building that may be given, a lien will be taken against the settler's holding and chattels. The lien will be repayable in 20 years, at 6 per cent., but no payment on account of either principal or interest shall be required until after the expiration of three years. At the expiration of five years from the time the settler takes up his land, and upon the observance of certain conditions during that time, he will be entitled to receive a patent from the Crown.

The community system will apply with regard to the provision of horses and other stock and implements, a supply of these being kept at headquarters for the use of the settlers on easy terms. Buying and selling will be done upon a co-operative basis, and every effort will be made to establish the men quickly upon a prosperous and independent footing.

The social side of life at the Colony will not be neglected. A proper public building, where both religious and secular gatherings may be held, will be provided, also a school-house and educational facilities. Arrangements will be made at an early date for married men to have their families with them, and, as far as possible, discharged soldiers with practical experience will be employed to direct the affairs of the Colony.

Soldiers who may desire to go into fruit farming and chicken raising, or other specialised branches, will be given free instruction at the Public Institution of the Province.

The Progress of Co-operative Societies in India.

DURING the twelve years which have elapsed since the Government of India passed the Co-operative Societies Act, the progress of the movement has been very remarkable, and has suffered little interruption either from bad harvests or from the outbreak of war. According to statements which have recently been issued for the year 1915-16, the number of Co-operative Societies of all kinds at the end of that year was 19,675, with a membership of 918,436, and a working capital of no less than £6,884,000, of which only £107,000 had been provided by Government. The corresponding figures for the previous year were 17,327 societies, with a membership of 824,469 and working capital of £5,977,000, so that marked progress continued to be made during the year. Of all the provinces, the Punjab takes the lead with 3,393 societies, 148,043 members and a working capital of £1,371,000. The statistics include

605 central institutions, such as provincial banks and unions, and 1,019 non-agricultural societies, but attention may be confined to the agricultural societies which so far limit their operations almost entirely to the provision of small loans to peasant farmers. These agricultural societies now number 18,051, with 717,163 members, an average of 40 members per society.

Detailed statistics have been furnished for 17,729 agricultural societies, of which 17,610 are Co-operative Credit Societies, practically all formed on the basis of unlimited liability. During the year these societies made loans to individuals amounting to £1,520,000, and at the end of the year the amount of loans due to them by individual members was £3,034,000. At the end of the year their working capital amounted to £3,440,000, made up as follows :—

	£
Paid-up share capital	510,000
Deposits made by members	227,000
Deposits made by non-members	235,000
Loans fron other societies and banks	1,980,000
Loans from Government	86,000
Reserve fund	402,000

The profit on the year's working was £132,000, which is equivalent to nearly 4 per cent. on the working capital, and the cost of management was only £30,000, an average of less than £2 per society.

These agricultural credit societies are usually able to borrow money at from 6 to 9 per cent., and the rate they charge on loans made to members generally varies from about 9 to 12½ per cent., which is a low rate in a country where it is difficult for the individual peasant, even when he is fairly solvent, to borrow money from the village banker at less than 20 per cent. By the establishment of these Co-operative Credit Societies, which are managed by the peasants themselves, but carefully controlled by a staff of Government officials, more than 700,000 peasants, who are most of them illiterate, are now enabled to obtain the capital necessary for their agricultural needs much more readily, and at a much lower rate of interest, than they could before.

The reserve funds, which already amount to nearly 12 per cent. of the working capital, are being added to year by year, and in the Punjab several societies are now practically independent of outside assistance, their share-capital, deposits and reserves being sufficient for the members' needs. They are thus enabled to reduce the rate of interest charged on loans to members from 12½ to 8 or 9 per cent.

A beginning has also been made, especially in Burmah, with the formation of Co-operative Societies for the insurance of plough-cattle. There are now in India 321 such societies, insuring 8,821 animals. During the last year, the number of animals on which claims had to be paid was 187, or little more than 2 per cent. of the animals insured, a rate of mortality which compares favourably with the 2½ per cent. per annum which is the rate of mortality in England and Wales for Co-operative Societies insuring dairy cows. Although these societies have only recently been started, they had at the end of the year accumulated reserve funds amounting to £1,063. If further experience shows that the rate of mortality continues low, there is little doubt that this branch of the movement also will rapidly spread, and that the Indian peasants will find that they can insure their cattle at very little cost by taking advantage of the co-operative principle.

OFFICIAL NOTICES AND CIRCULARS.

THE following Circular Letter, dated 14th June, 1917, has been addressed by the Food Production Department of the Board to Agricultural Executive Committees :—

Breaking Up of Pastures for the Harvest of 1918.

SIR,—The Board have given careful consideration to the representations which have been received from Agricultural Executive Committees and from other bodies of agriculturists with reference to the programme for the harvest of 1918 as outlined in the Board's Circular Letter of the 15th ultimo, F. P. 53.*

The task suggested in that letter was expressed in terms of the acreage of grassland in England and Wales that might have to be broken up and brought under cereals in order to render the country self-supporting in case of extremity, but it was also contemplated that more corn crops should be grown on existing arable land. This has not been fully understood in some quarters, and it is considered desirable, therefore, to restate the national task in terms of the total acreage that should be devoted in each county to corn crops, including beans and peas.

Suggestions have been made that the Board should indicate the contribution desired from each county in terms of quantity of produce rather than in acreage, and several Committees have expressed the view that the quantity of food required could be obtained by increasing the production from the existing arable land in preference to breaking up large areas of permanent grass.

The Board entirely agree with the view that the utmost possible use should be made of existing arable land, and that every endeavour should be made to obtain the largest possible yield, but they are satisfied that, under war conditions, and in view of the shortage of labour and fertilisers, it would be most unwise to assume that it will be possible, taking the county as a whole, to obtain more than the average yields per acre of the ten years preceding the War.

The programme for the harvest of 1918 has, therefore, been revised in the light of later developments and with the object of indicating to each county the total acreage of corn crops which it should aim at securing. The opportunity has also been taken to make certain adjustments which it is hoped will ease the task which the Committees are asked to undertake, and which will meet some of the objections brought forward by those who have expressed anxiety with regard to the milk supply.

It is possible to do this without impairing national security, as, owing to the fact that arrangements have now been made to grow much larger quantities of corn in Ireland and Scotland than was originally anticipated, the contribution of England and Wales to the food supply of the nation can be proportionately reduced.

[Here follows a revised estimate for the county addressed of the acreage of permanent grass to be broken up before next spring.]

These figures are submitted, in the first instance, for the consideration of your Committee, who should report to the Department at the earliest possible date whether there is any insuperable difficulty in securing the quota suggested or whether they desire to propose any modifications.

* See *Journal*, June, 1917, p. 351.

The success of the work of your Committee will depend largely on the judgment shown in selecting grassland for ploughing. It is clearly undesirable to break up stiff, wet land which would demand thorough draining and liming to enable it to produce grain; it is equally undesirable to break up poor, sandy soils for which manure is not available, and which could not be expected to yield even a moderate crop unless the season of 1918 were quite exceptionally favourable. Grassland of medium texture and fair fertility should be selected, so far as possible.

If, in the opinion of your Executive, it is impracticable to break up as much permanent grassland as the Department suggest, it is open to them to substitute an additional area of rotation grass. It must be remembered, however, that there is a point beyond which the breaking up of rotation grass cannot safely be carried, and, in view of the uncertainty of the duration of the War and the necessity for economising the fertility of our soils, it is preferable to use the fertility stored up in pastures rather than to exhaust the condition of arable land by continuous corn-growing.

In conclusion, I desire again to impress upon Executive Committees the importance of securing as much as possible of their county quotas by an agreement with the parties concerned and of only resorting to compulsion if all other means fail. In this connection it is hoped that the general principles laid down in my Circular Letter of 2nd June* will be observed by all Committees and, in particular, that the co-operation of owners or agents of large estates, should always be invited, in the first instance, in selecting such areas of grassland as may require to be broken up.

I am, etc.,
ARTHUR LEE,
Director-General.

Letter from the President of the Board of Agriculture to The Rt. Hon. Henry Hobhouse.

THE following Letter, dated 5th June, 1917, was written by the President of the Board of Agriculture and Fisheries to the Right Hon. Henry Hobhouse, to be read to the War Committee of Somersetshire :—

DEAR MR. HOBHOUSE,—You asked me to send you a letter on the agricultural programme for the increase of food production. I therefore write the following explanation of the figures originally submitted.

In 1915 the acreage devoted to wheat, barley and oats, respectively, in the United Kingdom was—

Wheat	2,051,729	acres.
Barley	1,651,874	,,
Oats	4,146,843	,,
	7,850,446	,,

On this acreage were produced—

Wheat	7,471,884	qr.
Barley	6,612,550	,,
Oats	21,333,782	,,
	35,418,216	,,

* See *Journal*, June, 1917, p. 349.

The agricultural programme for the United Kingdom in 1918 suggested the addition of 4,250,000 acres under cereals and potatoes.

It was further suggested that this acreage should be thus distributed between the three cereals—

Wheat	2,000,000
Barley	1,000,000
Oats	1,500,000

From this acreage it might be expected that an additional 19½ million qr. of grain would be produced, making the total production of grain approximately 55 million qr. This quantity, deducting 20 per cent. of the wheat and barley, and 40 per cent. of the oats, for seed, livestock, etc., would, if milled into flour, supply the 3,300,000,000 4 lb. loaves which the people of this country annually consume.

This result could also be partly obtained, if the necessary fertilisers and labour were available on the existing arable land, by increasing the yield per acre and by reducing the area in temporary grasses. But, under war conditions, the object aimed at can only be reached by using other methods than that of increased yield alone.

The main increase in wheat for 1918 will have to be obtained on the existing arable area by taking a crop after clover or temporary grasses, after wheat or barley, after oats, after potatoes or roots, after peas or beans, or after fallows. But room must be made for the displaced crops on a new acreage which must be prepared and ready by the early spring of 1918.

The new area to be ploughed must be carefully chosen for the purpose of growing crops. There is no magic in ploughing up unsuitable land. Strong, heavy land, grass which is fully productive for milk, or for fattening cattle, fields which experience has shown to be ill-adapted for arable cultivation, should be left down. The whole of the land of the country should be carefully inspected in order to select that which is most suitable for arable cultivation. No rule of thumb methods, no attempts to equalise the burden by asking each farmer to plough the same proportion, are possible. The capability of each county, of each district, of each parish, and even of each farm in the parish, should be ascertained by a complete survey of land suited to increased arable cultivation. It is only by careful selection that the War Executive Committees will be able to carry the feeling of the landowning and farming community with them in the work. Without the general support of agricultural opinion, the attempt to increase the area under cereals and potatoes will inevitably end in failure.

War Executive Committees are asked to do their best to secure the required increase, and to report progress. They cannot be expected to attempt the task, unless the necessary labour, horses, fertilisers, and machines are supplied. But it is plain that, if the additional cereals are not grown, any diminution in the quantity heightens the possible privations of the nation and lessens the effectiveness of the agricultural answer to the submarine menace.

The Food Production Department are issuing a new set of figures calculated on the changed circumstances since the original programme was framed.

Sincerely yours,

R. E. PROTHERO.

THE following Memorandum, dated 4th July, has been addressed by the President of the Board of Agriculture to County War Agricultural Executive Committees :—

Use of Compulsory Powers.

I desire to remind the War Executive Committees of the words which I used on 20th December, 1916, in starting the movement for increased corn production:

> "We propose to give you (War Agricultural Committees) wide powers to enter upon, occupy, cultivate, and put in the seeds that we want grown, whether it is corn or potatoes, on the land which you yourselves find to be insufficiently cultivated or not cultivated at all. We mean you to have compulsory powers. I need not say to you that you will do it by persuasion wherever you can and make a bargain with the man to do it. But remember this. Behind persuasion you will have the driving force of compulsory power. I think it is absolutely necessary that you should have it You will do your duty not merely to your class as farmers, but do it to the nation; and if you find it necessary, put the powers you will have into force."

The position has not altered. It remains the same to-day as it was six months ago. Speaking at Shrewsbury on the 1st June, 1917, I spoke as follows (according to the verbatim transcript of my speech) :—

> "Of course, the Executive Committees have been delegated some very big powers. Now I do hope that they are not going recklessly to use them. I am not one of those who believe in a farmer being compelled to do anything. Try everything else first You must try and carry the farmer with you, and the only way to carry the farmer with you is by being prudent, and careful, and fair in your choice of land which you want to have ploughed up. Of course, I know the sort of feeling people have—that it must be equal—that if A has got to plough up 20 acres, then it is only fair that B should plough up 20 acres. But is it? I don't think it is. I think you have to look at each farm by itself. You have got to see the balance of the farm, and you have to consider no end of other things."

Compulsion is no less distasteful to the Board of Agriculture than it is to farmers; yet it may, in certain circumstances, become a necessity. It has, of course, its limits. Unless the Committee is prepared to cultivate the land itself, it must consider the tenant's experience of arable farming, his command of the necessary implements and other similar points. In all cases, the exercise of compulsory powers should always be the last resort; but in some it also remains the final resort. For instance, a piece of land is selected by competent advisers as suitable for corn, and less productive of animal or human food as grass than it would be under the plough. If the Executive Committee, after due consideration of all the circumstances, decide that the selected land must, in the interest of the nation, be ploughed up—and if negotiation, argument, conference and persuasion have been tried unsuccessfully with both owners and occupiers—then, all other means having failed, the Committee must preceed to compulsion, and will be supported by the Board.

The ploughing-up of pasture may entail a sacrifice. But that sacrifice is nothing in comparison with that which is daily made by

the men who are fighting for us by land and sea; it is no greater, and is often much less, than that already demanded from many other industries and sections of the community. The nation needs the food. It cannot farm the land itself. It cannot make agriculture a controlled establishment. It is obliged, from the circumstances of the case, to leave food production in the hands of those who own, occupy, and till the soil. Just for that very reason it has the strongest claim on agriculturists to do their duty to the utmost.

THE following Memorandum, dated 26th June, 1917, was sent by the Food Production Department of the Board to Agricultural Executive Committees :—

Determination of Tenancies.

Where possession is taken of land under paragraph (1) (*a*) of Regulation 2M by an Agricultural Executive Committee on behalf of the Board of Agriculture, the contract of tenancy between the landlord and tenant has usually been allowed to continue. In many cases, the land taken over by the Committee forms only a comparatively small portion of the holding, and in these cases it is hoped that arrangements may be made by mutual consent between landlord and tenant for a readjustment of the tenancy, for an apportionment of the rent to the area of land retained by the tenant, and so on.

But there are also many cases where the Committee takes possession of an entire holding, or of the greater portion of a holding; and in such cases it may often be a hardship upon the tenant, if the contract between himself and the landlord remains in force. The tenant remains technically liable for the rent, although his possession may be suspended for a period of some years, as provided by the Defence of the Realm (Acquisition of Land) Act, 1916, and he may have taken another farm or found some other employment. At the end of that period, he will (unless in the meantime his tenancy has been determined by the landlord by notice to quit) as the person entitled to resume possession, be liable to pay to the Board the unexhausted value of all acts of cultivation or adaptation for cultivation executed during their occupation of the land. Under these circumstances, it would generally be fairer both to the tenant and to the landlord, and also desirable from the point of view of good cultivation that the contract of tenancy should be determined when possession has been taken of the land.

The Board have the power to determine the tenancy of an entire holding where necessary, under the conditions laid down in paragraph (1) (*f*) of Regulation 2M, and the Board will generally be prepared to exercise this power, on the recommendation of the Agricultural Executive Committee concerned, in any case in which possession has been taken of the whole or the greater part of a holding, and where it is thought fair that this should be done. Any direct and substantial loss borne by the landlord or tenant in consequence of this action may be the subject of an application for compensation to the Defence of the Realm (Losses) Commission, to be made according to the procedure indicated in the Circular F. P. 43, dated the 1st May, 1917,* and on any such application the landlord will be entitled to claim in respect of the compensation for tenant right, etc., which, under the contract of tenancy, custom or Agricultural Holdings Act, he has had to pay to the outgoing tenant on the determination of the tenancy.

* See *Journal*, June, 1917, p. 355.

Agricultural Executive Committees are therefore requested when reporting any case for authority to take possession of land, to state at the same time whether they recommend that the tenancy of the holding should be determined, giving the reasons why this is recommended.

They are also requested to furnish this Department as soon as possible with a complete statement of the lands of which they have already taken possession, showing the area and situation of those lands together with the area of the holding of which they form part, and stating whether they recommend that the tenancy of the holding should now be determined, and, if so, for what reasons.

Where possession has been taken for a temporary purpose only, such as manuring, mole-draining or specific acts of cultivation, the above remarks are not intended to apply.

The Duties of Supplies Sub-Committees.

THE following Circular Letter, dated 12th June, was addressed by the Food Production Department of the Board to County Agricultural Executive Committees in England and Wales :—

SIR,—1. The letter from this Department of the 16th May* proposed the appointment by each Agricultural Executive Committee of a Supplies Sub-Committee to make provision for meeting the needs of the area as regards seeds, fertilisers, etc. The work this Sub-Committee is invited to perform is of the highest importance in view of the largely increased demand for materials which is likely to arise owing to the Food Production Policy, but it presents a number of special difficulties which can only be overcome by action on well-considered lines.

2. The requirements of the country in the coming season may differ appreciably from those of the period before the War, and it is necessary, while making the best use possible of existing distributing agencies, to devise measures which will enable Executive Committees to ensure that farmers are not prevented from giving effect to the Food Production Policy owing to lack of materials.

3. *Estimate of Requirements.*—The first step is to ascertain the probable requirements of the county. The survey which is to be carried out for the purpose of selecting the land to be ploughed for the harvest of 1918 affords a means whereby these requirements can be estimated with fair accuracy. The further requirements should be gauged and the results of the survey checked by consultation with the principal agricultural merchants and co-operative societies, from whom estimates of the probable demand based on the actual sales for the past season should be obtained. It is important that the requirements should be based on the minimum rather than the maximum quantities likely to be needed, as the available supplies are necessarily limited.

The principal articles which it is suggested Supplies Committees should have in view are seed-corn, clovers, rye-grass, root-seeds, seed potatoes, sulphate of ammonia, superphosphate, basic slag, lime, sulphate of copper, binder twine, and pipes for land drainage. Other articles which Committees may think necessary in view of local requirements should be added to this list.

* See *Journal*, June, 1917, p. 344.

The result of the inquiries should be furnished to the Department as soon as possible. The Department will then endeavour to ensure that the requirements of the county are met, or that it receives a reasonable share of those articles of which the supply is very limited.

4. *Organising Distribution.*—One means which should immediately be considered by Committees as a step in the direction of organising distribution is the preparation of a list of co-operative societies, dealers and merchants who, on complying with the stipulations indicated below, should be recognised by this Department as "Approved Agents," for the supply of those commodities which may require special measures for their proper distribution. In order to secure a reasonable uniformity it will be necessary that the conditions on which the agents are recognised shall be submitted to this Department before action is taken.

By requiring these agents to maintain a sufficient stock of materials, and to sell at certain agreed prices, Committees could to a large extent ensure that farmers' requirements were promptly met.

5. Local storage is essential in the case of many agricultural requirements in order to prevent shortage in supply and delay in delivery owing to railway congestion. The recognition of a dealer, merchant or co-operative society as an "Approved Agent" should, therefore, be subject to a requirement that certain minimum quantities of seeds, fertilisers, etc., are stored on the agent's premises. Traders who are unable to offer satisfactory warehouse accommodation should not be recognised, but, subject to suitable undertakings being given, no firm of repute should be excluded from the list of "Approved Agents," as it is important to avoid the suspicion of favouritism. The minimum quantities to be stored need not be uniform, the essential point being that the agent should undertake to carry a stock appreciably higher than normal.

In addition to the increased quantities stored in the ordinary course of business, a consideration of local requirements may lead Committees to the opinion that further and special provision is necessary, and in such cases it would be open to them to arrange with "Approved Agents" for the storage of additional quantities on paying the charges involved.

6. Arrangements are being made with manufacturers in regard to the prices at which fertilisers and other articles should be sold by them at the works, and information on these points will be supplied to Committees from time to time as it becomes available. As the conditions applicable to each individual article vary, it is suggested that the appointment of an "Approved Agent" should be subject to an undertaking to sell those agricultural requisites in which he trades for cash at prices to be agreed.

In view of the special importance of storing sulphate of ammonia during the summer and autumn, in order to enable the works to continue production to the maximum extent, it may be necessary to require "Approved Agents" to take sulphate of ammonia into store, but in that case a suitable adjustment as to price will be made.

7. It is desirable that the purchases made by the Executive Committees on their own account should be made either through co-operative societies or through local firms agreeing to purchase on behalf of Committees at fixed rates of commission.

I am, etc.,

ARTHUR LEE,

Director-General.

THE following information respecting the provision of sulphate of ammonia, lime, and drain pipes has been sent by the Food Production Department of the Board in a letter dated 12th June, 1917, and addressed to the Agricultural Executive Committees.

Provision of Sulphate of Ammonia, Lime, and Drain Pipes.

1. *Sulphate of Ammonia.*—A notice is enclosed as to the prices at which sulphate of ammonia is to be sold during the season 1917–18.* It will be seen that a sliding scale of prices has been adopted, the object in view being to induce dealers, co-operative societies and farmers to take delivery in the summer and autumn: this is necessary in order to prevent production being interfered with owing to congestion of storage accommodation at makers' works.

2. Very much larger quantities of sulphate of ammonia must be reserved for application for next year's crops than the 140,000 tons used during last season. The quantity required for 1917-18 cannot be estimated at less than 200,000 tons, and it is hoped that it may reach 240,000 tons.

3. In order to secure that this supply shall be available for distribution when required, it is necessary to make provision as far as possible for storage locally, and steps should also be taken to secure its effective distribution to farmers.

4. With this object in view, I am to suggest that the appointment of the "Approved Agents" referred to in the letter from this Department of the 12th inst. (F. P. 56)† should be proceeded with at once, and that the choice of such agents should be made dependent on their undertaking to store a minimum quantity of 50 tons of sulphate of ammonia, and to maintain a stock at that rate up to the 30th March next.

5. The sliding scale of prices will enable agents to purchase sulphate of ammonia at £15 7*s*. 6*d*. per ton (less 10*s*. discount) during the period 1st June to 30th September, 1917, and to dispose of their stock to consumers in the three months October to December, 1917, at £15 15*s*., or in the subsequent five months, from January to May, 1918, at £16 7*s*. 6*d*. There is, therefore, sufficient financial inducement to dealers to incur the storage and capital charges involved, and, in addition, they will receive a valuable advertisement through being included in the lists of "Approved Agents" recognised by the Agricultural Executive Committees and by this Department.

6. Farmers in the district wishing to obtain supplies of sulphate of ammonia should be advised to purchase from them. Any applications from the district received direct by this Department will be referred to these agents. Such orders will not necessarily be met from the agent's store, but can be placed by him with the makers direct, and the agents will, in such cases, obtain the usual commission.

7. The stipulation that all "Approved Agents" shall be required to maintain stocks of sulphate of ammonia will avoid any appearance of discrimination in favour of any particular firm. Your Committee may also wish to take into account local considerations, and in particular to stipulate that the agents recognised shall undertake to sell other fertilisers at prices and on conditions to be agreed at a later date.

8. I am, therefore, to invite your Committee to take immediate steps to secure as many applications as possible from merchants, dealers and co-operative societies, who will be willing to maintain a minimum

* See *Journal*, June, 1917, p. 372. † See p. 461.

stock of 50 tons of sulphate of ammonia. A form of application for this purpose is enclosed,* and a further supply will follow. I shall be glad if you will send signed applications to me as soon as they have been approved by your Committee.

9. *Lime.*—The output of agricultural lime at the present time is reduced to approximately one half of pre-war production, but the Department is taking steps to increase the supply.

10. Offers are being obtained from makers to supply lime at prices below those at present ruling, provided orders for substantial quantities are placed with them by the Supplies Sub-Committees. It is suggested that your Committee should consider the possibility of collecting orders from farmers so that bulk orders may be given to suitable firms. A later communication will be addressed to you on the subject, but meanwhile I shall much appreciate a considered estimate, if it can be made, of the probable total requirements of the county during the coming season. The knowledge so obtained will greatly assist the Department.

11. *Drain Pipes.*—A considerable amount of draining is likely to be necessary in the case of low patches of land in fields which are being converted into arable, and it is desirable that the Committee should consider whether the supply of drain pipes obtainable in their neighbourhood is likely to be sufficient to meet the demand during the coming season. If there is any possibility of a substantial demand, it will be necessary to make arrangements with manufacturers well in advance. The Department will be glad to receive a report on this subject in order that appropriate steps may be taken.

THE following Memorandum, dated 2nd June, 1917, has been sent by the Food Production Department of the Board to Agricultural Executive Committees :—

Petrol for Farmers. The Food Production Department have been in communication with the Petrol Control Committee with reference to the supply of petrol to farmers, and arrangements have been come to which will ensure that every consideration shall be given to applications for petrol licences from farmers and others engaged in the essential work of producing food, provided that such applications have been examined and certified by the Agricultural Executive Committees for the county concerned.

In asking the Agricultural Executive Committees to undertake the work of examining such applications, the Food Production Department and the Petrol Control Committee feel that Agricultural Executive Committees are the only competent authorities possessing the requisite local knowledge to make recommendations that are fair and reasonable, having regard to the needs of the applicants and the paramount importance of economising the diminished supplies of motor spirit.

Petrol for Farmers for Use in Tractors, Stationary Engines and Motor Cars.—All applications by farmers for petrol licences must in future be made to the County Agricultural Executive Committees, who will assume the responsibility of making a recommendation on the form of application No. 95, issued by the Food Production Department, 214, Great Portland Street, London, W. 1. The application should be certified by the Chairman or Secretary of the Committee and sent direct to the Petrol Control Committee.

* Not here printed.

In view of the very serious situation at present existing as regards the supply of motor spirit it will be necessary for the Executive Committees to exercise the utmost care in making their recommendations.

Each application must be subjected to close investigation with the object of deciding the minimum quantity without which, the applicant could not carry on his essential work of food production. The quantity required for agricultural machinery will, of course, depend upon the amount of work to be done, but in the case of motor lorries, the possibility of reducing the number of journeys should always be borne in mind. As regards motor cars used in the ordinary course of the farmer's work, the Petrol Control Committee are of opinion that an allowance of 10 gal. per month, which corresponds to an average mileage of 200, is adequate, but they are prepared to consider recommendations for an increase beyond this quantity in cases where, owing to exceptional circumstances, the production of food would be seriously hindered by such restriction.

The Executive Committee must take care not to make a recommendation unless the applicant indicates clearly the purpose for which the petrol is required, and furnishes all the information required in paragraphs 1, 2 and 3, of the Application Form. Licences are issued "Free-of-Duty" for motor spirit for use in agricultural machinery and lorries, but a duty of 6*d*. per gal. is payable on all licences for motor spirit for use in motor cars or motor cycles which are liable to Motor Car Tax (see Finance Act, 1916). In making recommendations the Executive Committees must therefore take particular care that the nature of the licence or licences recommended, is clearly stated.

THE following Memorandum, dated 8th June, has been addressed by the Food Production Department of the Board to Agricultural Executive Committees :—

Control of Steam Tackle.

A desire has been expressed by several Executive Committees that they should be authorised to exercise some control over the sets of steam tackle in their counties. Under paragraph 1 (*b*) of Regulation 2M Executive Committees have power to take possession of any steam tackle (other than that in the possession or under the control of a dealer or manufacturer) if they are of opinion that it is required for the cultivation of land or the increase of the food supply of the country, but the Board think that as a general rule it would be unwise to requisition steam tackle from the present owners who in most cases are anxious that it should be as fully employed as possible. The Board understand, however, that in certain cases the owners of steam tackle are disposed to employ it mainly on land which could equally well be dealt with by motor tractors, with the result that arrangements cannot be made to plough up the class of grassland which can only be dealt with satisfactorily by steam cultivation.

The Board suggest, therefore, that the Machinery Sub-Committees should endeavour to organise the work of the sets of steam tackle in their counties in co-operation with the proprietors, so that they may be used to the best advantage in the national interest, and Executive Committees are authorised to guarantee to the proprietors payment for any work they undertake at the request or under the directions of the Committees. This should remove any unwillingness on the part of the proprietors of steam tackle to undertake work for which they

might find difficulty in obtaining payment, and if payment is made by the Executive Committees the expenditure should be recovered in due course by the Committees from the occupiers of the land under paragraph 4 of Regulation 2M.

If the proprietors of any set of steam tackle decline unreasonably to carry out the requests or directions of an Executive Committee, the facts should be reported to the Board, who will consider whether they should authorise the Committee to exercise their power of commandeering under Paragraph 1 (*b*) of Regulation 2M.

Labour for the Hay and Corn Harvests.

THE following Circular Letter, dated, 19th June, 1917, has been addressed by the Food Production Department of the Board to the County Agricultural Executive Committees in England and Wales:—

SIR,—1. The Army Authorities have agreed to provide a number of soldiers to assist with the hay and corn harvest in England and Wales. The men will be available only until the end of the corn harvest in your district. It is unlikely that the number of soldiers will be sufficient to meet all the applications for harvest labour, and farmers must be prepared to accept any civilians obtained by the National Service Department, including the Public School boys, schoolmasters and others who have offered their services during harvest time.

2. The soldiers will be sent to certain Military Distribution Centres, and some of them will be available immediately. The Centre for your county will be at

3. Farmers in your county requiring the assistance of these men must apply to your Committee on a form (F.P. 71), a copy of which is enclosed,* stating that they agree to the terms under which the soldier is being lent. The form has been framed to meet cases in which civilians have to be supplied. Further copies of the form are being sent under separate cover, together with additional copies of this letter. It will be necessary for you to fill in at the foot of the application form the address to which it should be returned on completion.

4. In the case of the soldiers, when the farmer boards and lodges the men he will pay the rate of wage current in the district for harvest work for agricultural labourers who live in, subject to the minimum rates mentioned below. Otherwise he will pay the rate current for harvest work for agricultural labourers who live out, subject to the minimum rates mentioned below. In the event of any dispute as to what the current rate is, whether for men living in or out, the decision of the County Agricultural Executive Committee will be final. *The farmer will pay the soldier direct the amount due to him.* The hours of work will be those customary in the district.

For the hay harvest the minimum rates of wages will be as follows, but the local rate of wage must be paid if in excess of these minimum rates:—

(*a*) 5*s*. 0*d*. for each week-day while the soldier is employed (and each Sunday on which he works). Soldier to provide his own board and lodging. Overtime at the rate of 6*d*. per hour, after 10 working hours.

or (*b*) 2*s*. 6*d*. for each week-day while the soldier is employed (and each Sunday on which he works). Board and lodging to

* Not here printed.

be provided by the farmer. Overtime at the rate of 6*d.* per hour after 10 working hours.

For the corn harvest the minimum rates will be as follows, but the local rate of wage must be paid if in excess of these minimum rates :—

(*a*) Cambridgeshire, Essex, Huntingdonshire, Isle of Ely, Lincolnshire, Norfolk, Soke of Peterboro', Suffolk, the East and West Ridings of Yorkshire, and Rutland : 7*s.* 0*d.* for a day of 10 working hours, if the soldier provides his own board and lodging, or 4*s.* 6*d.* if board and lodging is provided by the farmer, with 6*d.* an hour overtime.

(*b*) For the remaining counties in England and Wales : 6*s.* for a day of 10 working hours, if the soldier provides his own board and lodging, or 3*s.* 6*d.* if board and lodging is provided by the farmer, with 6*d.* an hour overtime.

The above rates to be inclusive of all allowances, and to be paid wet or fine.

5. The farmer will not have to pay railway fares, but will be required to make arrangements, at his own expense, for the conveyance of men between the railway station and the farm, to provide all necessary tools and appliances, and to insure the men under the Workmen's Compensation Acts, but he will pay no contribution for Health Insurance.

6. Applications received on the prescribed form should be passed by your Committee to the Sub-Commissioner of the National Service Department for your county, in accordance with paragraph 5 of the agreement between the Board of Agriculture and the National Service Department (F.P. 65). The Sub-Commissioner, who will be responsible for seeing that the labour required is supplied, has been instructed to place himself at once in communication with you, and it is hoped that with close co-operation between the Labour Officer of your Committee and the Sub-Commissioner of the National Service Department the soldiers will be despatched without loss of time to the farmers requiring their services. Time will be saved if Committees will forward application forms to the Sub-Commissioner, c/o the Officer Commanding the Distribution Centre, as the Sub-Commissioner will be constantly in attendance at the Centre assisting in the despatch of the men.

7. The rates of pay applicable to the civilians obtained by the National Service Department will be the current local rates for the hay or corn harvest with minimum rates of 25*s.* a week for living-out and 10*s.* a week for living-in. The terms and conditions of the employment of the school boy and other labour set out in the Board's Circular Letters of the 7th ultimo* and the 1st instant are not affected.

I am, etc.,

ARTHUR LEE,
Director-General.

Soldiers for the Hay and Corn Harvests.‡

THE following Circular Letter, dated 29th June, 1917, was addressed by the Food Production Department of the Board, to the County Agricultural Executive Committees in England and Wales :—

SIR—1. With reference to the Circular Letter (F. P. 74)†, of the 19th instant, as to the labour provided for the hay and corn harvests, representations

* See *Journal*, June, 1917, p. 341. † See p. 465. ‡ See also p. 482.

have been made that in many districts the soldiers lent by the Military Authorities will not be wholly employed on harvest work, inasmuch as a few weeks' interval will occur between the hay and corn harvests, during which time farmers engaging these soldiers will desire to employ them on general farm work.

2. The Military Authorities have agreed that when the men are not actually engaged in harvest work, the following minimum rates of wages will apply instead of those specified in paragraph 4 of the Circular above-mentioned, namely :—

(*a*) 4*s.* 2*d.* for each week-day while the soldier is employed (and each Sunday on which he works). Soldier to provide his own board and lodging.

or (*b*) 1*s.* 8*d.* for each week-day while the soldier is employed (and each Sunday on which he works). Board and lodging to be provided by the farmer.

The local rate of wage must, however, be paid if in excess of the minimum rates. The hours of work will be those customary in the district.

3. In connection with the allocation of these men, Agricultural Executive Committees should remember that these soldiers have been lent to agriculture specially to assist with the hay and corn harvests, and applications for soldiers for such work must, therefore, be given priority over demands for men for any other class of farm work.

I am, etc.,

ARTHUR LEE,
Director-General.

THE following Circular Letter, dated 20th June, 1917, has been addressed by the Food Production Department of the Board to Agricultural Executive Committees in England :—

Employment of Prisoners of War.

SIR,—Arrangements have now been made by which an additional number of military prisoners of war, who have had experience of agricultural work, are available for agriculture.

Agricultural Executive Committees are accordingly urged to forward at an early date further schemes for the employment of such prisoners on the land. Batches of prisoners of war, either military or civilian, can also be supplied for carrying out drainage schemes that are likely to increase production for the 1918 harvest.

In this connection it is to be noted that in the case of all the schemes under which prisoners are already being employed in agriculture, their work has given great satisfaction, and in nearly every case application has been made for more to be supplied.

The conditions of employment will be those described in the Circular Letter (A. 287/C), dated the 16th January last,* except that in special cases the minimum size of a batch may be reduced to not less than 40 men, and the guard is now calculated at one-third of the number of prisoners sent. A copy of the Circular Letters referred to is enclosed. Any schemes submitted should be on the lines of the enclosed draft.

I trust that your Committee will give this matter their very early attention, as it is important that the services of these prisoners should be utilised to the greatest possible extent.

I am, etc.,

ARTHUR LEE,
Director-General.

* See *Journal*, March, 1917, p. 1134.

THE President of the Board of Agriculture has issued the following appeal :—

Woman Labour on the Land.

The nation needs all the food that can be raised from the land at home. Whether farmers plough up grass or increase production on their existing arable area, or do both, they must have the necessary labour. They naturally like it best in the form to which they are most accustomed. Men who know the ways of the land and of their masters cannot be exactly replaced by strangers. Changes of staff cause trouble. But there is no choice. Labour must be found. Farmers, anxious as they are to do their duty by the nation, cannot reject without a trial, and, if need be, a patient trial, help from any quarter in which it is offered.

Women are ready and able to work on the land, however hard and disagreeable it may be. They have heard the country's call. They have answered generously and patriotically the appeal for their help. Those who live in their own homes on the spot have loyally come forward in large numbers. Farmers are glad of their services, and have learnt by experience how useful a women can be, even if she can only give half a day at a time.

There are also other women who offer to leave their homes, to pass through a course of training, to go wherever they are sent, to give their whole time on the farms, and within the limits of their physical strength to do whatever they are asked. Hundreds are already employed. But hundreds more are waiting to be hired. They cannot be expected to make their offer a second time or to wait for ever.

In the care of stock, in milking, in the management of horses, in all the odd jobs of a farm, in the ordinary field work, such as weeding, hoeing, or singling, the help of women has been again and again proved to be invaluable.

There are difficulties in housing whole-time women. But with goodwill on all sides these difficulties can be met. Every one who offers hospitality to women workers on the land is helping to win the War. Women are in addition to, and not in substitution for, the men already employed. No farmer, therefore, risks the loss of male labour by their employment.

Farmers cannot afford to allow woman labour to stand idle. They will gain, and the nation will gain, if it is put to the fullest possible use.

For all particulars of woman labour, application should be made to the Director-General, Food Production Department, 72, Victoria Street, S.W. 1, or to the County Organising Secretary in each county.*

THE following Notice, dated, 12th June, 1917, has been issued by the Food Production Department of the Board :—

Seed Wheat of the 1916 Crop.

In view of the necessity of providing seed wheat for early sowing next season the Food Production Department are prepared to buy seed wheat of the 1916 crop threshed after the 1st June. Wheat offered must be dry, *well cleaned*, free from smut, weeds and sprouted corn, and of good natural weight, and the Department will, until further notice, be prepared to offer for such wheat a premium above the maximum price for milling wheat.

Farmers who have wheat which they believe to be fit for seed for early autumn sowing are asked to offer the grain to the merchant with whom

* See also p. 482.

they usually deal, and at the same time to state the variety and approximate quantity. The merchant will submit a sample to the local Seed Wheat Purchasing Committee, who will decide at once whether the grain is suitable. If the Committee pass the sample, the merchant will complete the purchase of the wheat at the price authorised by the Committee and will arrange all further details of the transaction.

THE following Notice, dated 16th June, 1917, has been issued by the Food Production Department of the Board :—

Seed Wheat of the 1917 Crop.

In view of the importance of providing seed wheat for next year's harvest, the Government propose to acquire pure stocks of certain of the less plentiful varieties of autumn wheats. Crops in adequate quantity found after inspection to be suitable for seed will be purchased at a substantial premium above the milling price. Farmers with pure crops of not less than 20 acres of the following varieties, viz. : Wilhelmina, Victor, Little Joss, Browick, *are requested to communicate at once* with the Director-General, Food Production Department, 72, Victoria Street, London, S.W. 1.

Details are not at present desired of other more plentiful varieties of which it is expected adequate supplies will be available.

In writing to the Department the correspondent should state his name and address, the variety of wheat, the area sown, and the location of the crop.

Supplies of Seed Wheat for Autumn Sowing.

In a Circular Letter, dated 23rd June, 1917, addressed by the Food Production Department of the Board to the Agricultural Executive Committees, the following information respecting supplies of seed wheat for autumn sowing is sent for the consideration of the Supplies Sub-Committees :—

1. In order that provision may be made for the increased quantity of seed wheat that will be required for early autumn sowing in the coming season, the Department is making arrangements for the purchase and storage of varieties of the 1916 crop threshed after 1st June and suitable for sowing in the autumn.

2. The National British and Irish Corn Trade Association is setting up local Seed Wheat Purchasing Committees, who will act on behalf of the Department in the purchase of the grain. Farmers who have wheat which they believe to be fit for early autumn sowing are being asked to offer it to the merchant with whom they usually deal. The merchant will submit a sample to the local Seed Wheat Purchasing Committee, who will decide at once whether the grain is suitable. If the Committee pass the sample they will authorise the merchant to purchase the grain for this Department and inform him of the name and address of the storage agent to whom it is to be consigned.

3. Supplies Sub-Committees should at once arrange to collect and forward to the Department orders for supplies of this seed for autumn sowing. The price of good, sound, dry, well-cleaned seed will not exceed 92*s.* 6*d.* per quarter of 504 lb. f.o.r. at store. Reasonable precautions will be taken to select suitable wheat for sowing, but no warranty expressed or implied will be given as to quality, purity or productiveness.

4. A large quantity of suitable seed of the 1916 crop is not likely to be available: farmers should therefore be urged to place their orders as soon as possible. It is desirable that they should name two or three alternative varieties in case the one which they prefer cannot be supplied.

5. In addition to the arrangements for the purchase and storage of suitable seed wheat of the 1916 crop, the Department is preparing a scheme for the purchase of selected varieties of the 1917 crop, particulars of which will be communicated to Supplies Sub-Committees at an early date.

Poultry Advisory Committee.

A NOTICE, dated 15th June, 1917, stated that the President of the Board of Agriculture and Fisheries has appointed an Advisory Committee to consider and report upon technical questions of poultry management and feeding, both in general and in detail, and on general questions of the organisation of the poultry industry, with a view to securing that the readjustment of the industry to war conditions shall be made in the most approved manner. The question whether the Board's scheme for distributing sittings of eggs* should be continued for the season 1917–18 or not is also referred to the Committee.

The Committee is constituted as follows:—

Mr. T. W. Toovey (*Chairman*)	National Utility Poultry Society.
,, Gerald Martin	Ministry of Food.
,, P. A. Francis	Board of Agriculture for Scotland.
,, Wilfred Buckley ..	Agricultural Organisation Society.
,, Tom Barron	National Utility Poultry Society.
,, W. G. Tarbet	Utility Duck Club.
,, Tom Newman	Scientific Poultry Breeders' Society.
,, C. Longbottom ..	Northern Utility Poultry Society.
,, F. M. Youngman, J.P.	Framlingham and Eastern Counties Egg and Poultry Co-op. Society.
,, G. Tyrwhitt Drake ..	Poultry Club.

Also a representative, when required, of the Poultry Research Society.

Mr. J. R. Jackson, Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, S.W. 1.

At the first meeting of the above Committee, on the 8th June, several resolutions were passed and presented to the President of the Board for consideration. Among the resolutions under consideration is one which supplements advice already given by the Board, and to which Mr. Prothero wishes to give immediate effect by advising poultry-keepers to follow the opportune and practical suggestions it contains. The resolution is as follows:—

> "That all hatching should cease for 1917; that all old stock cocks should be killed at once; that, with the exception of certain hens selected for breeding stock, all hens hatched in 1915 or earlier that go broody and show signs of moult should be cleared as well as any 1916 hens that indicate by their appearance that they will not be profitable; that, as soon as possible, all 1917 hatched cockerels not required for stock purposes in 1918 should be killed."

* See p. 391.

An Order, dated the 14th June, 1917, has been made by the Board of Agriculture and Fisheries, providing that :—

The Sale of Horses Order, 1917.

The following bodies and persons are hereby authorised to exercise on behalf of the Board the power of issuing licences under Regulation 2T,* that is to say :—

(*a*) In the case of an agricultural holding situate wholly or partly in an administrative county having a War Agricultural Executive Committee constituted under the Cultivation of Lands Order, 1917 (No. 3), that Committee ;

(*b*) In the case of an agricultural holding situate wholly in the administrative county of London, the clerk of that council ;

(*c*) In the case of an agricultural holding situate wholly in the city and county borough of Birmingham, the War Agricultural Executive Committee constituted under the Cultivation of Lands (Birmingham) Order, 1917 (No. 2) ; and

(*d*) In the case of an agricultural holding situate wholly in any other county borough, the clerk of the borough council.

Schedule.

2T.—1. An occupier of an agricultural holding in Great Britain shall not sell or part with the possession of any horse used, or capable of being used, for the cultivation of the holding except with the authority of a licence granted under this Regulation.

2. The Board of Agriculture and Fisheries in relation to any holding in England or Wales may by licence authorise the occupier of a holding to sell or part with the possession of a horse, if the Board are satisfied that the cultivation of the holding will not be thereby prejudiced, or that for any other reason the issue of such a licence is necessary or desirable, and any licence so issued may contain such conditions as the Board think desirable.

3. The Board hereinbefore referred to may authorise any person or any body constituted by the Board under these Regulations to exercise on behalf of the Board the power of issuing licences under this Regulation.

4. Any person who sells or parts with the possession of a horse in contravention of this Regulation or fails to comply with any condition of a licence issued under this Regulation, and any person who buys any horse which he knows to be sold to him in contravention of this Regulation shall be guilty of a summary offence against these Regulations.

The following Circular Letter, dated 19th June, 1917, has been addressed by the Food Production Department of the Board to the County Agricultural Executive Committees and County Borough Councils in England and Wales, and the London County Council :—

Prohibition of Sale of Agricultural Horses.

SIR,—1. With the object of retaining an adequate supply of horses on the land a Regulation (2T) has been made under the Defence of the Realm Consolidation Act, 1914, prohibiting the sale of any horse used or capable of being used for the cultivation of the land except under licence. The

* See Schedule below.

Board of Agriculture and Fisheries are empowered to delegate the power of granting licences to any person or to any body constituted by the Board.

2. Acting under this Regulation the Board have made the Sale of Horses Order, 1917 (with which the Regulation is embodied),* delegating to the Agricultural Executive Committees the power to issue licences for such sale. For London and County Boroughs in which no Agricultural Executive Committee exists, these powers are delegated to the clerks of the County Council and County Borough Councils.

3. The Order prohibits an occupier of any agricultural holding selling or parting with the possession of any horse used or capable of being used for the cultivation of the holding, except with the authority of a licence which may be granted if the Executive Committee or other authority named in the Order is satisfied that the cultivation of the holding will not be thereby prejudiced or that for any other reason the issue of such a licence is necessary or desirable, and any licence so issued may contain such conditions as the Executive Committee or other authority may think desirable. For the purposes of this Regulation and Order "agricultural holding" means any piece of land which is wholly agricultural or wholly pastoral, or part agricultural and as to the residue pastoral, or in whole or in part cultivated for the purposes of the trade or business of market gardening; and "occupier" includes any person for the time being having the management of the holding.

4. In considering the question as to whether the cultivation of a holding will be prejudiced by the sale of a horse, the Board desire that regard should be had to the proper working of any additional land which might reasonably be brought into cultivation by the occupier of the holding for the harvest of 1918.

5. The expression "any horse used or capable of being used for the cultivation of a holding" should as a general rule, be considered to include unbroken horses, suitable for farm work, of two years old and upwards, and in view of the urgent need for horses for agricultural purposes such horses should be broken in forthwith.

6. In granting any licence authorising a sale the Committee should satisfy themselves that the vendor intends to sell the horse (if suitable for the purpose) to an occupier of an agricultural holding, or to a person duly authorised by the Board of Agriculture and Fisheries or the Army Council to purchase the horse for Government purposes, and this should be secured by a condition of the licence unless there are any special circumstances that justify its being waived. This condition has been inserted in the form of licence sent herewith,† and should be struck out if not required. A space has been left for the insertion of any special condition imposed in a particular case.

In every case it should be made a condition that the detachable part of the licence should be signed by the licensee and the person to whom the animal is sold or transferred, and returned to the authority granting the licence within three days after the sale, or in any event within 21 days of the date when the licence was issued. The number should be inserted on both parts as well as on the counterfoil at the time of issue.

7. The Board have under consideration a scheme which has as its object the purchase of any horses which are surplus to farmers' own

* Printed above. † Not here printed.

requirements for use in connection with the cultivation of a largely increased area of land for the harvest of 1918, so as to provide a supply of horses which will supplement any that may be rendered available by the military authorities for that purpose.

8. In order to facilitate the purchase or better distribution of any surplus horses for agricultural purposes or when necessary for Army requirements, you are requested to issue a notice forthwith, inviting farmers within your area who have surplus horses for sale to notify you of that fact, giving the necessary particulars, and after such offers have been reviewed to ascertain whether the horses can be considered as surplus to the farmers' requirements, to forward a list to this Department each week.

I am, etc.,

ARTHUR LEE,
Director-General.

Swine Fever (Regulation of Movement) Order, 1917.

THE following Circular, dated 8th June, 1917, has been addressed by the Board of Agriculture to Local Authorities in Great Britain under the Diseases of Animals Acts, 1894 to 1914. :—

1. The President of the Board of Agriculture and Fisheries has had under consideration the general restrictions at present in operation in Great Britain under the Swine Fever (Regulation of Movement) Order of 1908 on the movement of swine between the various Scheduled Areas into which Great Britain is divided for the purposes of that Order.

2. In all the existing circumstances, Mr. Prothero has decided, with the view of facilitating the movement of swine, to make the following modifications of the present arrangements and restrictions, namely :—

(*a*) To amend the provisions of the Swine Fever (Regulation of Movement) Order of 1908, so as to afford additional facilities in certain cases for movement from one Scheduled Area to another for breeding and feeding purposes ;

(*b*) To withdraw entirely the Swine Fever (Special Areas) Orders of 1911 and 1912, which restricted movement into certain Scheduled Areas in Scotland, Wales, and the North of England, from the remainder of Great Britain, to swine required for breeding purposes only ; and

(*c*) To enlarge certain of the Scheduled Areas, and thus to extend considerably the areas of free movement.

3. In order to give effect to that part of the President's decision referred to in (*a*) of the previous paragraph, an Order has been made by the Board, entitled the Swine Fever (Regulation of Movement) Order of 1917.*

Article 1 of this new Order permits of the movement of a sow under a licence (Form A) to premises in a Scheduled Area from premises outside that area and back again to the premises from which it was originally moved, if the sow is moved for the purpose of being stocked, and the double movement takes place within the 8 days or less period during which the licence is available. It is not intended that this provision should be utilised for the purpose of authorising long-distance movements for breeding purposes, but only for movement to and from a neighbouring boar on premises which are in an adjoining Scheduled

* Not here printed.

Area. The Board suggest that the inspectors of the local authority should be instructed to exercise their discretion in the matter of the issue of licences in this connection.

Article 2 allows movement for feeding purposes to premises authorised for the purpose by the local authority of the district, of any swine (including swine which at present are permitted to be moved only to a bacon-factory or slaughterhouse) provided that the movement is authorised by a licence (Form C) granted by an inspector of the local authority of the district in which the authorised premises are situate. *All* pigs moved to premises so authorised as well as *all* pigs (if any) already on the premises at the time the premises are authorised, are required by the new Order to be detained on the premises until moved under a further licence (Form C), to a bacon-factory or slaughterhouse or until slaughtered. The object of this Article is to facilitiate the movement of pigs for feeding until ready for slaughter, especially immature pigs sent to a market from which under the conditions hitherto obtaining they could be moved only direct to a bacon-factory or slaughterhouse. Pigs from Ireland landed under the Swine Fever (Movement from Ireland) Order of 1904, and pigs exposed at Birmingham and Newcastle-upon-Tyne markets come within the scope of this provision.

The Order does not in any way alter the restriction on movement into or out of a Swine Fever Infected Area or Swine Fever Infected Place.

4. The proposals contained in (*b*) and (*c*) of the second paragraph of this letter, have been embodied in three new Application Orders, which re-define the limits of the Scheduled Areas which it has been decided to enlarge, and revoke the existing Application Orders. These Orders are entitled respectively, the Swine Fever (Regulation of Movement) Application Order of 1917 (No. 1), the Swine Fever (Regulation of Movement) Application Order of 1917 (No. 2), and the Kent and Surrey (Swine Fever) Order of 1917. The Application Order (No. 2) revokes, amongst other Orders, the Swine Fever (Special Areas) Orders of 1911 and 1912.

The general effect of these three Application Orders is to reduce the number of Scheduled Areas in Great Britain from 38 to 15, as well as to abolish the special restrictions contained in the Swine Fever (Special Areas) Orders as already explained. No alteration is made in the existing Application Orders which constitute the Scheduled Areas of Norfolk, Suffolk, Essex, London, East and West Sussex, and Yorkshire (West Riding), but the modifications made by the Swine Fever (Regulation of Movement) Order of 1917, described in the third paragraph of this letter apply, of course, equally to all Scheduled Areas.

Sale of Wool (Great Britain) Order, 1917.

THE Army Council issued an Order, dated 22nd June, 1917, to the effect that:—

1. No person shall sell raw wool grown or to be grown on sheep in Great Britain and the Isle of Man during the season of 1917, including fleece wool and skin wool, but not including daggings, locks, brokes and fallen wool, otherwise than to persons authorised by or on behalf of the Director of Army Contracts, or at prices other than those set out in the Schedules hereto annexed or at such other prices as in any particular case may be allowed by or on behalf of the Director of Army Contracts.

2. No person shall sell raw wool (as hereinbefore defined) grown or to be grown on sheep in Ireland during the season of 1917 otherwise than in accordance with the provisions of the Sale of Wool (Ireland) Order, 1917.

3. No person shall make or take delivery of or payment for any wool of the description aforesaid otherwise than in accordance with the provisions of this Order, whether in pursuance of any contract entered into prior to the date hereof or otherwise.

4. All persons having in their custody or control any stocks of wool of the description aforesaid are hereby required to sell such wool to any persons authorised by or on behalf of the Director of Army Contracts as may be required by him or on his behalf, and to make deliveries to such persons in such quantities and at such times and places as may be specified by him or on his behalf.

5. No person shall mix or wind in any fleeces of the description aforesaid any brokes or dead wool, locks, daggings or other matter whatsoever.

6. The Order made by the Army Council relating to raw wool grown or to be grown on sheep during the season of 1917, and dated the 5th day of April, 1917, is hereby cancelled.

SCHEDULE A.

PRICE LIST FOR ENGLAND.

Class of Wool.	*Pence per lb.*
Lincoln Hogs and Wethers ..	18
Notts, Leicester and Yorks Hogs and Wethers	18½
Border Leicesters	18
Lincs and Yorks Halfbreds ..	19
Notts, Yorks, Wolds and Leicester Halfbreds	20
Norfolk Halfbreds	20
Staffs ,, ...	20½
Shropshire, Oxford and Hants Downs	21½
Wilts	22½
Dorset and Sussex Downs and Horns	23½
Eastern Counties Downs ..	21
Kent Tegs	20½
,, Ewes and Wethers ..	18½
,, Halfbreds	21
,, Downs	21½
Cotswold, Somerset and Glos. Deep Washed	17½
Devon, Cornwall and Somerset Strong Greasy	14½
Devon, Cornwall and Somerset Crossbred Greasy	15
Devon, Cornwall and Somerset Horns	15½
Cluns and Best Kerries ..	19½
Fine Radnors	18
Deep ,, ...	17
Best Welsh Fleeces	16
Low ,, ,, ...	14½
Scotch Washed	14½
,, Unwashed	12½
Massams	15
North Halfbred Hogs ..	19
,, ,, Wethers ..	18½
Herdwick	12½
Wensleydale	19
English Cheviots, Washed ..	18½

SCHEDULE B.

PRICE LIST FOR WALES.

Class of Wool.	*Pence per lb.*
Shropshire	21½
Best Kerry and Clun Forest ..	20½
Best Radnors	18½
Kempy Radnors or Crossbreds	17
Best Welsh	16
Low ,, ...	14½
Turbary Welsh	13
Scotch	13½
Shropshire Shorn Lamb ..	18
Kerry and Clun Forest Shorn Lamb	16½
Radnor and Crossbred Shorn Lamb	15
Welsh Shorn Lamb	13

The above prices are maximum prices for well-washed wool in light condition (except where otherwise stated), packed and delivered free within reasonable distance.

SCHEDULE C.

PRICE LIST FOR SCOTLAND.

Class of Wool.	Washed. Pence per lb.	Unwashed. Pence per lb.
Cheviot Hogg North ..	22¼	18
,, Ewe ,, ..	18¾	16¼
Clips 1/5th Hogg ..	20¼	16½
Cheviot Hogg Border ..	20¼	16½
,, Ewe ,, ..	18¼	15½
Clips 1/5th Hogg ..	18¾	15¾
Half Bred Hogg North .	19½	16¼
,, Wether ,,	18¾	15¾
Clips Half Hogg ..	19¼	15¾
Half Hogg South ..	19¼	15¾
Half Bred Ewe ..	18½	15½
Clips Half Hogg ..	18¾	15¾
Shrop. Hogg	20¼	16¼
,, Ewe	18½	15
Leicester Hogg and Ewe Clips ,, ,,	18	15¼
Cross Hogg and Ewe ..	15¼	14¼
Black-faced Hogg and Ewe ..	14¼	12¾
,, Fallen ..	—	11¾

The above prices are maximum prices for wool in good condition, packed and delivered free within reasonable distance.

SCHEDULE D.

PRICE LIST FOR ISLE OF MAN.

Class of Wool.	Pence per lb.
Shropshire	16
Shropshire and Manx Cross ..	16
Cheviot	16
Leicester	15
Lincoln	15
Leicester and Scotch Cross ..	13
Black-faced Scotch	12

The above prices are maximum prices for unwashed wool, best quality, in good condition, packed and delivered free at warehouse.

Price of Cereal Screenings.

THE following Letter, dated 28th June, 1917, has been addressed by the Ministry of Food to the Board of Agriculture :—

SIR,—I am directed by the Flour Mills Control Committee to inform you that any screenings extracted from wheat or other cereals shall from this date be sold at a price not exceeding £15 per ton net weight at the mill door.

Any charges for delivery to be added to the invoice.

Sacks if supplied are to be charged for as a separate item.

I am, etc.,
F. W. DAWSON.

Restrictions on the Use of Wheat Straw.

WITH reference to the Army Council Order of 9th May,* relative to the use of straw, it is notified by the Secretary of the War Office that the Army Council wish it to be understood that the prohibition of the use of wheat straw for litter will be withdrawn on 11th October.

Any farmer in the meantime who is in any special difficulty can apply to the District Purchasing Officer of Supplies for a licence to use straw as litter or for any other purpose, and such licence will not be unreasonably withheld.

* See *Journal*, June, 1917, p. 364.

Permission to Import Gooseberry Plants into Sweden.

BY an Order dated 14th April, 1917, the prohibition hitherto in force of the importation into Sweden of gooseberry plants from abroad has been suspended until further notice, the condition attached being that the plant shall be accompanied by a certificate from an official plant pathologist to the effect that the plants have been disinfected before exportation.

Cartridges and Shot.

THE following Memorandum, dated 27th June, 1917, has been sent by the Food Production Department of the Board to Agricultural Executive Committees in England and Wales:

This Memorandum supersedes all previous instructions issued to Agricultural Executive Committees on the subject of shot-gun ammunition.

In view of the imperative necessity for economy in the use of lead, and other components, the Minister of Munitions is desirous of restricting the use of shot-gun ammunition to the destruction of vermin and the preservation of crops.

At the instance of the Minister of Munitions it has been made illegal by the Army Council (under the powers vested in them by the Defence of the Realm Regulations) for retailers to sell shot-gun ammunition to consumers except upon the production of a purchase licence duly issued by an Agricultural Executive Committee, and such licences shall only be issued when the Committee consider that the ammunition is absolutely necessary for the purposes named. Under Army Council Instruction 945 of 1917, orders are being issued by the Competent Military Authorities making the purchase of shot-gun ammunition illegal, unless covered by a licence in the approved form.

By Army Council Instruction 945 of 1917, "The authority for issuing licences for shot-gun ammunition has been delegated to the War Agricultural County Executive Committees in England and Wales, to whom all applications must be made." Purchase licences are licences for consumers to purchase by retail for their own use, and are in Form 23A.

A number of copies of this form are sent herewith,* and further copies will be sent on application. No other form should be used, and any stock of forms previously in use should be destroyed or used as waste-paper. The form speaks for itself. No name of any vendor should be inserted.

The licensing of vendors to sell shot-gun ammunition is in the hands of the Competent Military Authority. Agricultural Executive Committees are not concerned with it, but only with the issue of licences to consumers to purchase ammunition for their own use for the destruction of vermin and the preservation of crops; they are not authorised to license the purchase of ammunition for shooting game (except so far as this is done for the protection of crops) or for the destruction of vermin to preserve game. The licences should be issued in the most sparing manner possible.

Agricultural Executive Committees should not entertain any application for a licence for the purchase of ammunition except for use within the county, or within an adjoining county borough. Persons who desire to purchase ammunition for use in any other county should be referred to the Agricultural Executive Committee for that county.

* Not here printed.

Subject to the limitation of the amount of material which is available for manufacture into shot-gun ammunition, the Minister of Munitions has left manufacturers free to supply vendors on the ordinary lines of the trade. As the licence does not contain the name of a vendor it will be open to the licensee to apply to any vendor for the amount of ammunition covered by the licence.

In order to be able to regulate the future supply of materials, the Minister of Munitions is anxious to be kept informed of the amount of shot-gun ammunition of which the purchase is licensed. Agricultural Executive Committees should, therefore, keep a record of the amount licensed by them, and should furnish to this Department before the 10th of each month the total quantity of each kind of shot-gun ammunition licensed in the preceding month. The first report should be furnished not later than 10th August.

Harvest Weather Forecasts.

THE Meteorological Office will, as in past years, but subject to certain restrictions, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of a registration fee of 1*s.* and the cost of the telegrams, computed at 9*d.* per day. The supply of forecasts will continue until 30th September. The forecasts are drawn up each week-day at 3.30 p.m., and refer to the probable weather during the 15 hours from 6.0 a.m. to 9.0 p.m. on the next day. The addition of a "further outlook" and the issue of notifications in connection with spells of settled weather are suspended during the War.

Applications for the forecasts should be sent to the Director, Meteorological Office, South Kensington, London, S.W., with a cheque or postal order payable to the Meteorological Committee, to cover the cost of the telegrams for the period, which should not be less than 6 consecutive days, during which the forecasts are to be sent.

The Stone Fruit (Jam Manufacturers' Prices) Order, 1917.

AN Order, dated 6th July, 1917, has been made by the Food Controller to the effect that :—

1. A person who for purposes of sale manufactures jam, or bottles, or otherwise in any form preserves fruit (hereinafter called a jam manufacturer), shall not after the date of this Order by himself or his agent buy or agree to buy for the purposes of such manufacture or preserving any fruit of the varieties mentioned in the Schedule at a price exceeding that specified as applicable thereto, or pay to the seller or his agent in respect of such fruit any charges other than those permitted under this Order.

2. The price specified shall in all cases include all charges for picking and packing.

3. Where the fruit is bought to be placed on rail, ship or barge at the grower's station, port or wharf, the specified price in such case is the price, free on rail, ship or barge.

4. The additional charges permitted under this Order are :—

(*a*) Where the fruit is delivered by the seller to the purchaser's premises, or for sale in a market, the customary charges in

respect of such delivery, not exceeding in any case an amount equal to the reasonable cost of transport from the grower's railway station, port or wharf to the purchaser's premises or the market where sold.

(*b*) For the use of baskets or usual packages (other than sacks) a charge not exceeding the rate of 25*s*. per ton of fruit.

(*c*) All market tolls actually paid in respect of the fruit.

5. Where a jam manufacturer employs an agent in the purchase of any fruit to which this Order applies, he shall not pay to such agent a commission or other remuneration exceeding 12*s*. 6*d*. per ton of such fruit bought through the agent.

6. Where any fruit to which this Order applies is bought by or on behalf of a jam manufacturer, such fruit shall, until the contrary be proved, be deemed to be bought for the purpose of manufacturing jam or preserving fruit for sale.

7. A person shall not knowingly sell or offer to sell to a jam manufacturer for the purpose of manufacturing jam or preserving fruit for sale any fruit to which this Order applies at a price or subject to a charge not permitted under this Order.

8. A person shall not in connection with a purchase or disposition or proposed purchase or disposition of any fruit to which this Order applies enter or offer to enter into any fictitious or artificial transaction.

9. This Order shall not apply to any fruit grown outside the United Kingdom.

THE SCHEDULE.

Variety of fruit.	*Price at rate per ton.* £ s. d.
Egg Plums	10 10 0
Other Plums	12 10 0
Farleigh or Kent Damsons	12 0 0
Pin, or Prune or other Damsons	14 0 0
Greengages	22 0 0

The Raspberries (Manufacturers' Prices) Order, 1917.

AN Order, dated 10th July, 1917, has been made by the Food Controller to the effect that :—

1. A person who for the purposes of sale manufactures jam or essence from raspberries (herein aftercalled a jam manufacturer) shall not, after the date of this Order, by himself or his agent buy or agree to buy for the purposes of such manufacture any raspberries at a price exceeding a rate of £35 per ton, or pay to the seller or his agent in respect of such raspberries any charges other than those permitted under this Order.

2. The price specified shall include all charges for picking and packing.

3. Where the raspberries are bought to be placed on rail, ship or barge, at the grower's station, port or wharf, the specified price in such case is the price, free on rail, ship or barge.

4. The additional charges permitted under this Order are :—

(*a*) Where the raspberries are delivered by the seller to the purchaser's premises, or for sale in a market, the customary charges in respect of such delivery, not exceeding in any case an amount equal to the reasonable cost of transport from the

grower's railway station, port or wharf, to the purchaser's premises or the market where sold.

(*b*) For the use of tubs, baskets, or usual packages, a charge not exceeding the rate of 25*s*. per ton of raspberries.

(*c*) All market tolls actually paid in respect of the raspberries.

5. Where a jam manufacturer employs an agent in the purchase of any raspberries, he shall not pay to such agent a commission or other remuneration exceeding 20*s*. per ton of such raspberries bought through the agent.

6. Where any raspberries are bought by or on behalf of a jam manufacturer, such raspberries shall, until the contrary be proved, be deemed to be bought for the purpose of manufacturing jam or essence for sale.

7. A person shall not knowingly sell or offer to sell to a jam manufacturer for the purpose of manufacturing jam or essence for sale any raspberries at a price or subject to a charge not permitted under this Order.

8. (*a*) Where any contract subsisting at the date of this Order for the purchase of raspberries bought for the purpose of manufacturing jam or essence for sale, or bought with a view to the same being resold for such purpose, provides for payments in excess of those permitted under this Order, the contract shall stand so far as concerns any raspberries delivered on or before the date of this Order, but otherwise shall be avoided.

(*b*) For the purpose of this clause raspberries bought in quantities of 5 cwt. or more shall, until the contrary be proved, be deemed to have been bought for the purpose or with the view aforesaid.

(*c*) This clause shall not apply to any contract where the Food Controller otherwise determines, or where the amount of raspberries agreed to be delivered or, at the date of this Order remaining to be delivered, is less than 5 cwt.

9. A person shall not in connection with a purchase or disposition or proposed purchase or disposition of any raspberries enter or offer to enter into any fictitious or artificial transaction.

10. This Order shall not apply to any raspberries grown outside the United Kingdom.

The Raspberries (Scotland) Delivery Order, 1917.

AN Order, dated 10th July, 1917, has been made by the Food Controller to the effect that :—

1. Any contract to the contrary notwithstanding all raspberries grown in Scotland shall, as picked, be delivered to the Food Controller by the grower in accordance with the instructions of a person nominated for the purpose by the Food Controller, and such raspberries when so delivered shall become the property of the Food Controller and will be paid for as to raspberries in good condition at the maximum prices applicable to raspberries under the Raspberries (Manufacturers' Prices) Order ; and no raspberries grown in Scotland shall be delivered to any other person or on any other terms except under and in accordance with the terms of a licence granted by the Food Controller.

2. This Order shall not apply to a grower of raspberries whose total crop does not exceed 1 cwt.

The Standing Timber (United Kingdom) Order, 1917.

AN Order, dated 4th July, 1917, was made by the War Office to the effect that:—1. From the date hereof until further notice no person shall, without a permit issued by or on behalf of the Controller of Timber Supplies, buy any standing timber in the United Kingdom provided that nothing herein contained shall apply—

(1) to any purchase of real estate having timber standing thereon.

(2) to any purchase of standing timber for an amount not exceeding in the aggregate for any one purchaser in respect of any period of three months the sum of £300.

2. All persons engaged in the purchase or sale of standing timber shall furnish such particulars as to their business as may be required from time to time by or on behalf of the Controller of Timber Supplies.

The Home Grown Timber Prices (Great Britain) Order, 1917.

AN Order, dated 4th July, 1917, was made by the War Office, to the effect that:—1. From the date hereof until further notice no person shall, without a permit issued by or on behalf of the Controller of Timber Supplies, sell any timber grown in Great Britain of the descriptions set out in the Schedule hereto annexed at prices exceeding the prices set out in the said Schedule, or such other prices as in any particular case may be allowed by or on behalf of the Controller of Timber Supplies.

2. All persons engaged in the purchase or sale of converted timber, including pitwood, grown in Great Britain, shall furnish such particulars as to their business as may be required from time to time by or on behalf of the Controller of Timber Supplies.

SCHEDULE.

	Spruce or Scots Fir. *Per cubic foot.*	*Larch.* *Per cubic foot.*
	s. d.	*s. d.*
Deals and Battens, in sizes of 2 in. by 2 in. to 4 in. by 9 in., averaging 11 ft. long... ..	3 0	3 6
Boards, averaging 7 in. wide.		
Thicknesses, under ½ in. ..	4 0	4 6
,, ½ in. to 1 in. inclusive ..	3 6	4 0
,, over 1 in. to 1⅞ in. inclusive ..	3 3	3 9
Timber, over 4 in. thick, averaging 11 ft. long / *Planking*, 9 in. wide, averaging 11 ft. long	3 9	4 3

Sleepers, (either Spruce, Scots Fir, or Larch), 9 ft. long by 10 in. by 5 in.—

	s. d.
8 in. face at	7 6 each.
7 ,, ...	7 0 ,,
5 ,, ...	6 3 ,,

The above prices are for timber delivered free on rail at loading station and are subject to customary discount for payment in one month.

Cheap Railway Fares for Women Workers in Agriculture.

THE following Notice was issued on 5th July, 1917:—The Board of Agriculture and the Ministry of Labour (Employment Department) have arranged with the Railway Executive Committee that cheap return fares at the rate of a single fare and a quarter for the return journey, without the 50 per cent. addition, or at half that rate for a single journey, will be available for all women seasonal workers in agriculture who have *bonâ fide* engagements with farmers and fruit growers. The new arrangement is already in operation.

The cheap tickets which have up till now been available in certain districts at railway booking offices will be discontinued after the 14th instant, and women workers will then only be able to obtain a reduced fare by means of a railway warrant issued on behalf of the Board of Agriculture or the Employment Department on payment of the reduced fare.

These warrants will not, in any circumstances, be issued by the Board of Agriculture direct to the women, therefore all applications from women who have not been recruited by the Employment Exchanges or the National Service Department must be made to the Women's National Land Corps, 50, Upper Baker Street, London, W., or to any other society recognised by the Board for placing women in agriculture.

Voluntary societies desiring these facilities should apply to the Board of Agriculture for warrants under conditions laid down by the Board. These facilities will not be limited to parties of over eight as has hitherto been the case.

Women who have secured employment on the land through the Employment Exchanges will, as heretofore, obtain their railway warrants from local Employment Exchanges.

Soldier Labour.

THE following Memorandum, dated 10th July, has been addressed by the Food Production Department of the Board to Agricultural Executive Committees in England and Wales:—

The Military Authorities have issued instructions that no soldiers who are now engaged on agricultural work are to be withdrawn from the land until further notice. This instruction applies to all classes of soldiers who have been made available for agricultural work.

The soldiers due to return to their units on the 25th instant may, therefore, remain on the farms where they are at present employed until such time as your Committee find it necessary to make use of their services elsewhere.

The 1917 Crop (Restriction) Order, 1917.

AN Order, dated 13th July, 1917, has been made by the Food Controller to the effect that:—

1. No person shall, without a permit issued under the authority of the Food Controller, either on his own behalf or on behalf of any other person,

(*a*) buy, sell or deal in; or

(*b*) offer, or invite an offer, or propose to buy or sell or deal in ; or

(*c*) enter into negotiations for the sale or purchase of or other dealing in

any wheat, barley, oats or rye of the 1917 crop grown in the United Kingdom, or any potatoes of the 1917 crop, grown in the United Kingdom other than first and second earlies.

2. Except in such cases as the Food Controller shall otherwise determine, and except also in the case of any contracts made by, or under the authority of, any Government Department, all contracts for the sale or disposition of any part of the crops referred to in Clause 1 hereof are cancelled.

3. Infringements of this Order are summary offences against the Defence of the Realm Regulations.

Correction.

IN the June issue of this *Journal*, p. 282, a reference was made in a footnote to the *Journal of the Royal Agricultural Society*. The reference should read "*Journal of the Royal Horticultural Society*, 1901–02, p. 832."

Leaflets in 1917.

SINCE the date of the list given on p. 1024 of the *Journal* for January, 1917, the following Leaflet has been issued in the ordinary series :—

No. 308.—*Plum Aphides.*

In addition, the information in the following Leaflets has been revised and brought up to date :—

No. 1.—*Black Currant Gall Mite.* This Leaflet has been entirely re-written.
No. 10.—*Wireworms.*
No. 23.—*Potato Disease.* This Leaflet has been entirely re-written.
No. 31.—*Onion Fly.*
No. 105.—*Wart Disease of Potatoes.*
No. 111.—*Increasing Profits from Eggs.*
No. 127.—*The Stalk (Sclerotinia) Disease of Potatoes and Related Sclerotinia Diseases.* This Leaflet has been entirely re-written.
No. 132.—*Slugs and Snails.*
No. 137.—*Potato Scab.* This Leaflet has been entirely re-written.
No. 173.—*Potato Growing.*
No. 197.—*Agricultural Education in England and Wales.*
No. 234.—*Botrytis Diseases.*
No. 264.—*Cultivation of Onions.*
No. 273.—"*White Heads,*" *or* "*Take All*" *of Wheat.*
No. 296.—*Potato Growing in Allotments and Small Gardens.*
No. 298.—*Pig-Keeping for Cottagers and Small Holders.*

The following Special Leaflets have been issued since the date of the last list :—

Special Leaflet No. 67.—*Economy in Using Potatoes.*
" " No. 68.—*Hints on Purchasing "Seed" Potatoes.*
" " No. 69.—*The Culture of Early Potatoes under Glass.*
" " No. 70.—*The Cultivation of Parsnips.*
" " No 72 —*Short Term Credit for Farmers.*
" " No. 74.—*Cutting of Seed Potatoes.*
" " No. 75.—*The Manufacture of Cheese in Co-operative Dairies.*
" " No. 76.—*Feeding Stuffs and Live Stock.*
" " No. 77.—*Hay-making Machinery.*

The following Special Leaflets have been revised and brought up to date :—

Special Leaflet No. 3.—*Poultry on Allotments and Garden Plots.*
" " No. 20.—*Coconut Cake and Palm Kernel Cake.* This Leaflet has been entirely re-written.
" " No. 26.—*Suggestions to Allotment Holders for General Cropping during the Spring and Summer Months.*
" " No. 37.—*Economy in Food: Appeal to Country People.*
" " No. 45.—*Calf Rearing.*
" " No. 49.—*The Selection of Wheats for Spring Sowing.*
" " No. 56.—*The Manuring of Cottage Gardens and Allotments.*
" " No. 68.—*Hints on Purchasing "Seed" Potatoes.*

The following unnumbered Leaflets have also been issued :—
Notice to Poultry Keepers respecting the Feeding of Poultry.
Organisation and Establishment of Co-operative Cheese Factories.

MISCELLANEOUS NOTES.

Notes on Crop Prospects Abroad.

The *International Crop Report and Agricultural Statistics* for June, 1917, published by the International Institute of Agriculture, contains figures of the estimated production of the cereal crops of 1917 in a few countries in the Northern Hemisphere.

Wheat.—The production in France, United States, India and Japan is estimated at 152,899,000 qr., against 150,062,000 qr. last year, the increase amounting to 1·9 per cent.

Rye.—The estimated production in the United States in 1917 is placed at 6,753,000 qr., or an advance of 22·2 per cent. on the previous year, when the production was 5,526,000 qr.

Barley.—The production in the United States is estimated at 25,672,000 qr., against 21,705,000 qr. in 1916, or an advance of 18·3 per cent.

Oats.—It is estimated that the production in the United States will amount to 148,666,000 qr., as compared with 128,374,000 qr. last year, the advance equalling 10·3 per cent.

The condition of the crops in other countries (100 being taken to represent the average yield during the past 10 years) is given as follows : *Wheat* : Ireland 95, Switzerland 96, Canada 92 ; *rye* : Ireland and

Norway 100, Switzerland 96, Canada 97; *barley*: Ireland 100, Switzerland 99, Canada 95; *oats*: Ireland 95, Switzerland 100, Canada 91.

Uruguay.—The final estimate of the crops of 1916–17 places the production of wheat at 674,000 qr., against 1,233,000 qr. in the previous year, or a reduction of 45·4 per cent.

Russia.—A Press Association message, dated 26th June, states that, according to information received by the Russian Government from 487 districts, the yield of winter wheat promises to be below average in 77 districts: average in 48; bad in 29; satisfactory in 221; and good in 57. The condition of spring wheat is slightly below normal, growth having been hindered by the cold weather early in May. (*Broomhall's Corn Trade News*, 27th June.)

Canada.—According to a report, dated 22nd June, received from the High Commissioner for Canada, the Census and Statistics Office at Ottawa estimate the area sown with wheat this year at 13,450,250 acres, or 4 per cent. greater than the area harvested in 1916. In a later report, dated 29th June, it is stated that the condition of crops in the three prairie provinces is considered good.

United States.—According to a report issued by the Statistical Bureau of the Department of Agriculture the condition of the crops on the 1st July was as follows (1916 figures in brackets for comparison): winter wheat, 75·9 (75·7); spring wheat, 83·6 (89·0); barley, 85·4 (87·9); oats, 89·4 (86·3); winter rye, 79·4 (87·0); maize, 81·1 (82·0). The yield of winter wheat is now estimated at 402,000,000 bush. as compared with 482,000,000 bush. last year; spring wheat, 276,000,000 bush. against 158,000,000 bush.; barley, 214,000,000 bush. against 181,000,000 bush.; oats, 1,453,000,000 bush. against 1,252,000,000 bush.; and rye 56,000,000 bush. against 47,000,000 bush. in 1916. The area under maize is estimated at 121,000,000 acres as compared with 108,620,900 acres last year, and the yield at 3,124,176,000 bush. against 2,583,000,000 bush. last year. The condition of hay on 1st July was 84·3, and the yield is estimated at 103,000,000 tons. The amount of old wheat in farmers' hands is estimated at 15,720,000 bush. compared with 73,760,000 bush. a year ago. (*Broomhall's Corn Trade News*, 10th July.)

Agricultural Conditions in England and Wales on 1st July.

THE Crop Reporters of the Board, in reporting on agricultural conditions in England and Wales on the 1st July, state that the warm weather and rains have improved the prospects of most of the crops. Wheat has improved and has grown well, but there are in nearly all districts some thin and patchy pieces, especially on the light soils which suffered from drought. The yield is not expected to come up to the average. Barley is promising, and is likely to be the best of the cereal crops, though not quite reaching the average. Oats are not so satisfactory, except in the north and north-west of England, where over-average yields are anticipated, but the general result is for a crop below the normal. Straw is generally short for all cereals. Beans and peas have not done well, and both crops will be below the average.

Potatoes have made a strong and healthy growth, and are generally free from disease. An over-average crop is expected in all districts.

Turnips and swedes have suffered from the dry weather of the early part of the month, fly has been very troublesome, and much has had to be re-sown. Mangolds have done better and are now looking well, and a yield slightly over the average is anticipated.

The hay harvest is backward, and little progress has yet been made in many districts owing to unfavourable weather conditions. The cutting of seeds' hay is more forward than that of the meadow hay, and the yield of both classes is expected to be less than usual.

Towards the middle of the month pastures began to look bare, but the later rains have effected an improvement. Live stock have done well, and are generally in good condition.

The weather has been favourable for the growth of hops, and the bine has made a strong and healthy growth. Very little fly is mentioned, and washing has been less than usual. An over-average yield is expected in Kent, and an average in the western counties.

The prospects for the fruit crops, especially of orchards, are not so favourable as a month ago owing to attacks by caterpillars, although over-average crops of apples, plums, pears and cherries are still anticipated. Raspberries, currants and gooseberries also promise large crops.

Labour is everywhere deficient, but the shortage has to some extent been met by the employment of women and of soldiers in those districts where they have not been withdrawn.

Summarizing the returns, and expressing an average crop by 100, the condition of the crops on the 1st July indicated probable yields per acre which may be denoted by the following percentages: Wheat, 94; barley, 98; oats, 93; beans, 88; peas, 94; potatoes, 103; mangolds, 101; seeds' hay, 97; meadow hay, 95; hops, 102.

Agricultural Labour in England and Wales during June.

The following local summaries give further details regarding agricultural labour in the different districts of England and Wales.

Northumberland, Durham, Cumberland and Westmorland.—The supply of labour is scarce, although women, and in some districts soldiers, have relieved the situation considerably.

Lancashire and Cheshire.—The supply of labour is generally deficient. In some districts Irish haymakers are numerous, but are asking for increased wages. The lateness of the hay harvest has somewhat mitigated the shortage.

Yorkshire.—The supply of labour is barely sufficient to enable farmers to carry on their work. The outlook is not good for the hay harvest, and few Irishmen have as yet arrived.

Shropshire and Stafford.—The shortage is still keenly felt, but is somewhat modified by the assistance rendered by women and soldiers throughout the district.

Derby, Nottingham, Leicester, and Rutland.—All districts report a grave shortage, which is only partly relieved by the assistance of women and soldiers.

Lincoln and Norfolk.—Labour is still very deficient, but assistance for hoeing and haymaking has been received from women and soldiers in some districts.

Suffolk, Cambridge, and Huntingdon.—The supply of labour is very deficient, but women are being largely employed, and the employment of soldiers is also reported from some districts.

Bedford, Northampton, and Warwick.—Labour, especially skilled, is deficient, but great assistance is being rendered by women and soldiers for hoeing and haymaking. Wages are still rising.

Buckingham, Oxford, and Berkshire.—Labour generally is very deficient; the shortage is being met in some districts by the employment of women and soldiers, but in others this help is unobtainable.

Worcester, Hereford, and Gloucester.—Labour is still very scarce, but to some extent the shortage has been made good by the employment of women and soldiers.

Cornwall, Devon, and Somerset.—The scarcity is still keenly felt for both regular and casual work, in spite of the high wages offered. Women and soldiers have, to a large extent, made this deficiency less acute.

Dorset, Wiltshire, and Hampshire.—Labour is generally short, but with the assistance of soldiers and women the work has been kept in hand.

Surrey, Kent, and Sussex.—The supply is mostly inadequate, especially for hoeing, but much help is being given by women.

Essex, Hertford, and Middlesex.—Labour is very short, but is somewhat relieved by the assistance given by soldiers and women; it will still prove short during harvest time.

North Wales.—Labour is still scarce, although wages offered are very good. The shortage of both regular and casual labour will be especially felt during the harvest, but women and soldiers are assisting very largely.

Mid Wales.—In some districts labour is extremely scarce, but farmers anticipate more help from soldiers for the hay and corn harvest, and in some instances women are being employed.

South Wales.—Labour is very scarce throughout the division.

Prevalence of Animal Diseases on the Continent.

THE following statement shows that according to the information in the possession of the Board on 1st July, 1917, certain diseases of animals existed in the countries specified:—

Austria (*on the 30th May*).—Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Denmark (*month of April*).—Anthrax, Foot-and-Mouth Disease, Swine Erysipelas, Swine Fever.

France (*for the period 20th May—2nd June*).—Anthrax, Blackleg, Foot-and-Mouth Disease, Glanders and Farcy, Rabies, Swine Erysipelas, Swine Fever.

Germany (*for the period 15th—31st May*).—Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Swine Fever.

Holland (*month of May*).—Anthrax, Foot-and-Mouth Disease, Foot-rot, Swine Erysipelas.

Hungary (*on the 30th May*).—Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Italy (*for the period 21st—27th May*).—Anthrax, Black-leg, Foot-and-Mouth Disease (449 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever.

Norway (*month of April*).—Swine Fever.

Sweden (*month of April*).—Anthrax, Swine Fever.

Switzerland (*for the period 4th—10th June*).—Anthrax, Blackleg, Swine Fever.

No further returns have been received in respect of the following countries: Belgium, Bulgaria, Montenegro, Rumania, Russia, Serbia, Spain.

The Weather in England during June.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
Week ending 2nd June:								
England, N.E. ...	56·3	+3·4	0·17	4	— 7	2	8·4	+2·1
England, E.	59·7	+4·6	0·07	2	— 8	1	9·9	+2·7
Midland Counties ...	57·7	+3·0	0·80	20	+ 8	3	6·4	0·0
England, S.E. ...	58·2	+2·5	0·49	13	+ 3	2	7·7	+0·3
England, N.W. ...	55·5	+1·6	0·96	24	+10	4	5·7	—1·0
England, S.W. ...	55·2	+0·3	1·02	26	+15	4	4·8	—2·1
English Channel ...	55·0	−0·9	0·51	13	+ 1	3	6·4	—1·7
Week ending 9th June:								
England, N.E. ...	56·4	+2·7	0·18	5	— 6	2	7·5	+1·4
England, E.	59·9	+3·9	0·05	1	—12	1	9·9	+3·2
Midland Counties ...	57·9	+1·9	0·35	9	— 5	2	7·8	+1·7
England, S.E. ...	59·7	+2·8	0·16	4	—10	1	10·8	+3·9
England, N.W. ...	56·1	+1·0	0·60	15	+ 5	3	7·5	+0·7
England, S.W. ...	57·0	+0·9	0·34	9	— 5	3	8·7	+1·9
English Channel ...	59·9	+3·0	0·22	6	— 7	2	10·3	+3·0
Week ending 16th June:								
England, N.E. ...	59·5	+5·2	0·14	4	— 6	1	10·3	+3·9
England, E.	63·1	+7·3	0·18	5	— 7	1	10·5	+3·7
Midland Counties ...	62·4	+6·6	0·12	3	— 7	1	10·6	+4·2
England, S.E. ...	62·9	+6·3	0·33	8	— 2	1	9·9	+2·8
England, N.W. ...	60·9	+5·4	0·04	1	—11	1	9·9	+2·8
England, S.W. ...	60·6	+4·5	0·06	2	—12	1	9·9	+2·7
English Channel ...	61·8	+4·8	0·00	0	— 8	0	9·6	+1·4
Week ending 23rd June:								
England, N.E. ...	58·6	+2·5	0·51	13	— 1	4	6·1	+0.2
England, E.	62·4	+4·5	0·51	13	+ 2	4	7·2	+0·5
Midland Counties ...	59·5	+2·1	0·54	14	0	4	5·4	−0·4
England, S.E. ...	61·3	+3·0	0·52	13	+ 2	3	6·8	—0·1
England, N.W. ...	55·9	+0·5	1·29	33	+15	4	6·0	+0·3
England, S.W. ...	58·2	+1·2	0·70	18	+ 4	5	6·3	+0·2
English Channel ...	60·6	+2·3	0·87	22	+10	4	9·3	+1·9
Week ending 30th June:								
England, N.E. ...	53·4	—4·3	0·44	11	— 1	3	5·6	—0·8
England, E.	57·5	—2·1	1·08	28	+17	5	3·3	—4·0
Midland Counties ...	54·6	—4·5	0·98	25	+11	4	3·8	—2·7
England, S.E.... ...	57·9	—2·1	1·58	40	+30	4	3·9	—3·9
England, N.W. ...	53·7	—4·1	0·23	6	—11	2	7·9	+1·6
England, S.W. ...	55·0	—3·4	1·63	42	+27	4	5·2	—1·8
English Channel ...	57·7	—1·8	1.00	25	+16	5	5·6	—3·0

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JUNE.		SIX MONTHS ENDED JUNE.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	25	43	293	318
Animals attacked	31	56	336	376
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	24
Glanders (including Farcy):—				
Outbreaks...	4	6	15	27
Animals attacked	6	9	27	71
Parasitic Mange:—				
Outbreaks	216	144	1,590	1,476
Animals attacked	363	349	3,187	3,452
Sheep-Scab:—				
Outbreaks	15	5	383	177
Swine Fever:—				
Outbreaks	284	568	1,412	2,615
Swine slaughtered as diseased or exposed to infection	138	1,659	609	8,085

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JUNE.		SIX MONTHS ENDED JUNE.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	1	—	3	2
Animals attacked	3	—	5	6
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—	—	1	—
Parasitic Mange:—				
Outbreaks	5	8	28	37
Sheep-Scab:—				
Outbreaks	23	14	233	226
Swine Fever:—				
Outbreaks	17	36	141	159
Swine slaughtered as diseased or exposed to infection	76	228	930	884

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES in June and May, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	JUNE.		MAY.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Polled Scots	20 5	18 3	17 11	16 11
Herefords	19 6	17 10	17 2	15 11
Shorthorns	19 2	17 9	17 5	16 2
Devons	18 6	16 11	17 3	15 6
Welsh Runts	—	—	—	16 4
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	*d.*	*d.*	*d.*
Veal Calves	17¼	15¼	16¼	14
Sheep :—				
Downs	18¼	16¾	17¾	16½
Longwools	17	15¾	16½	15¼
Cheviots	19	17½	19	17½
Blackfaced	17¾	16½	18¾	17½
Welsh	16¾	15½	17	15¾
Cross-breds	18¼	16½	18	16½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bacon Pigs	16 0	15 1	16 0	15 0
Porkers	16 7	15 9	16 5	15 6
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Shorthorns—In Milk ...	44 10	35 5	42 16	34 7
,, —Calvers ...	41 8	33 5	40 16	32 16
Other Breeds—In Milk ...	43 19	33 8	39 9	31 13
,, —Calvers ...	28 10	26 10	28 0	25 10
Calves for Rearing	4 4	3 5	3 16	2 18
Store Cattle :—				
Shorthorns—Yearlings ...	17 19	15 15	16 16	15 0
,, —Two-year-olds...	26 17	23 0	27 0	22 18
,, —Three-year-olds	36 3	30 13	35 8	29 19
Herefords —Two-year-olds...	28 12	24 8	28 8	22 12
Devons— ,,	28 13	24 7	29 1	24 9
Welsh Runts— ,,	27 11	22 4	26 9	21 15
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Downs or Longwools ...	70 9	62 4	80 11	68 8
Store Pigs :—				
8 to 12 weeks old	36 9	27 9	35 1	26 8
12 to 16 ,, ,, ...	60 11	47 11	57 5	45 2

* Estimated carcass weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND in June, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Leeds.	Liverpool.	London.	Manchester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*	*s.* *d.*
BEEF :—						
English	1st	139 0	136 0	—	141 6	144 0
	2nd	134 0	128 6	—	134 6	139 6
Cow and Bull	1st	126 0	127 6	123 6	114 6	128 6
	2nd	116 6	117 0	99 0	106 0	119 0
Irish: Port Killed	1st	140 0	—	143 6	140 0	141 6
	2nd	133 0	—	130 6	132 0	135 6
Argentine Frozen—						
Hind Quarters	1st	—	—	—	—	—
Fore ,, ...	1st	—	—	—	—	—
Argentine Chilled—						
Hind Quarters	1st	126 6	126 0	122 0	128 6	122 0
Fore ,, ...	1st	102 0	99 6	99 6	100 6	99 6
American Chilled—						
Hind Quarters	1st	—	—	—	132 0	—
Fore ,, ...	1st	—	—	—	103 0	—
VEAL :—						
British	1st	139 0	147 0	140 0	140 0	133 0
	2nd	130 6	116 6	108 6	121 6	107 6
Foreign...	1st	—	—	—	—	—
MUTTON :—						
Scotch	1st	—	169 0	158 6	172 6	160 0
	2nd	—	157 6	137 6	163 6	151 6
English...	1st	157 6	169 0	—	165 6	151 6
	2nd	148 0	157 6	—	156 6	143 6
Irish: Port Killed	1st	154 0	—	144 6	157 0	152 6
	2nd	—	—	130 6	148 0	134 0
Argentine Frozen	1st	95 6	95 6	95 6	93 6	95 6
New Zealand ,, ...	1st	86 6	—	86 6	87 6	86 6
Australian ,, ...	1st	—	—	—	—	—
LAMB :—						
British	1st	169 0	179 6	168 0	176 0	164 6
	2nd	158 6	168 0	149 6	163 6	155 0
New Zealand	1st	100 6	—	98 0	98 0	98 0
Australian	1st	100 6	100 6	98 0	98 0	98 0
Argentine	1st	105 0	105 0	105 0	102 6	105 0
PORK :—						
British	1st	133 0	131 0	—	121 6	—
	2nd	128 6	121 6	—	111 0	—
Frozen	1st	103 6	103 0	88 6	102 6	93 6

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at certain MARKETS in ENGLAND in June, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	—	—	—	—	22 0	21 0
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery—Fresh	195 0	191 0	191 0	187 0	192 0	188 0
,, Factory	181 0	176 0	174 6	170 0	179 6	173 6
Danish...	—	—	210 6	207 0	202 6	199 0
French...	—	—	—	—	203 0	194 6
Dutch	—	—	—	—	191 0	181 0
American	—	—	—	—	—	—
Australian	191 0	187 0	187 6	183 6	189 0	185 0
New Zealand	198 6	196 6	196 6	194 6	193 0	189 0
Argentine	—	—	—	—	186 6	182 6
CHEESE :—						
British—						
Cheddar	165 0	162 0	—	—	148 0	—
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	158 0	151 0	158 0	—
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	162 0	160 0	—	—	162 0	160 0
BACON :—						
Irish (Green)	147 0	145 0	150 6	145 0	147 0	140 0
Canadian (Green sides)	128 6	126 6	126 0	122 6	124 6	120 6
HAMS :—						
York (Dried or Smoked)	—	—	—	—	190 0	180 0
Irish (Dried or Smoked)	—	—	—	—	155 0	150 6
American (Green) (long cut)	130 0	127 0	127 0	124 6	127 6	124 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British...	—	—	—	—	21 5	19 9
Irish	19 3	—	18 10	17 9	19 7	18 6
Danish	—	—	—	—	20 10	18 6
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Arran Chief	—	—	—	—	—	—
Edward VII.	—	—	—	—	—	—
Evergood	—	—	—	—	—	—
HAY :—						
Clover	—	—	150 0	—	139 0	129 6
Meadow	—	—	—	—	139 0	129 6

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1915, 1916 and 1917.

Weeks ended (*in* 1917).	WHEAT.						BARLEY.						OATS.					
	1915.		1916.		1917.		1915.		1916.		1917.		1915.		1916.		1917.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	46	2	55	8	76	0	29	7	47	8	66	4	26	5	31	5	47	1
,, 13 ...	48	9	56	7	75	8	30	5	48	6	65	7	27	6	31	11	47	2
,, 20 ...	51	6	57	2	75	8	31	3	49	6	64	9	28	10	32	6	47	4
,, 27 ...	52	8	58	0	75	10	32	5	51	0	64	5	29	10	32	11	47	8
Feb. 3 ...	53	3	58	3	75	10	33	7	52	5	64	0	30	3	32	4	47	3
,, 10 ...	54	8	57	6	76	0	34	7	52	10	63	5	31	1	32	2	46	11
,, 17 ...	56	0	56	11	76	3	34	11	53	6	63	8	31	5	31	9	47	3
,, 24 ...	56	0	58	2	76	9	35	3	54	2	63	9	31	8	32	2	47	8
Mar. 3 ...	55	11	59	4	77	4	34	6	55	7	64	0	31	8	32	4	48	0
,, 10 ...	54	8	58	2	78	0	33	5	55	6	63	7	31	0	32	3	48	7
,, 17 ...	53	9	57	9	78	10	32	2	55	4	64	1	30	7	31	10	49	4
,, 24 ...	54	3	55	11	80	3	31	11	54	6	65	6	30	6	31	4	50	4
,, 31 ...	54	6	53	6	81	5	31	9	53	8	71	10	30	6	30	5	51	10
Apl. 7 ...	54	9	51	8	84	4	31	3	53	7	69	11	30	4	30	1	55	1
,, 14 ...	55	4	53	2	85	2	30	10	53	1	71	10	30	5	30	7	57	2
,, 21 ...	56	5	55	3	84	10	31	5	52	10	70	6	30	11	31	8	59	8
,, 28 ...	58	3	56	3	81	1	32	7	53	5	69	5	31	5	32	4	58	6
May 5 ...	60	5	55	7	77	7	33	3	53	1	64	4	32	4	32	10	54	9
,, 12 ...	61	7	55	5	78	0	34	0	53	5	64	11	32	5	33	1	55	2
,, 19 ...	62	0	55	0	77	11	34	1	52	10	64	10	32	8	33	0	55	2
,, 26 ...	61	11	54	7	78	0	34	8	52	9	64	9	32	7	33	4	54	11
June 2 ...	61	9	53	3	78	0	35	4	53	9	65	11	32	5	33	3	54	11
,, 9 ...	60	1	51	2	78	0	34	5	52	8	67	7	32	4	32	7	55	0
,, 16 ...	56	1	48	10	78	2	34	3	50	9	75	6	31	9	32	1	55	1
,, 23 ...	52	0	47	6	78	1	34	4	49	10	75	0	31	9	31	3	55	2
,, 30 ...	49	5	46	3	78	3	35	3	49	1	73	11	31	1	30	10	55	1
July 7 ...	50	1	46	3	78	1	34	7	45	6	69	5	31	6	30	8	55	2
,, 14 ...	52	7	48	11			35	8	47	5			31	6	31	6		
,, 21 ...	53	10	51	6			35	10	48	8			32	1	32	3		
,, 28 ...	55	3	53	5			36	1	47	2			31	1	32	5		
Aug. 4 ...	55	4	55	1			35	7	46	1			31	5	32	9		
,, 11 ...	55	2	56	7			37	0	46	11			31	7	31	2		
,, 18 ...	54	3	58	1			39	4	48	0			31	4	30	8		
,, 25 ...	51	11	59	0			38	3	47	1			30	0	31	6		
Sept. 1 ...	45	3	59	4			38	1	48	5			26	10	30	5		
,, 8 ...	43	0	59	3			37	11	51	7			26	8	31	1		
,, 15 ...	42	9	59	11			39	0	52	6			26	4	30	9		
,, 22 ...	43	3	59	4			39	8	53	3			26	1	30	9		
,, 20 ...	43	5	58	10			40	4	54	1			26	5	31	1		
Oct. 6 ...	44	1	59	2			41	0	54	5			26	5	30	9		
,, 13 ...	45	9	59	7			42	3	53	10			27	1	31	6		
,, 20 ...	48	2	60	9			44	0	53	8			28	1	31	11		
,, 27 ...	50	3	62	10			46	2	54	6			29	1	32	10		
Nov. 3 ...	51	6	66	7			47	3	56	2			30	4	34	0		
,, 10 ...	52	8	69	8			47	5	58	0			30	11	35	8		
,, 17 ...	53	6	70	9			47	11	59	8			31	3	37	8		
,, 24 ...	54	2	70	8			48	7	61	8			31	1	39	7		
Dec. 1 ...	53	7	71	3			48	11	63	1			30	11	41	4		
,, 8 ...	52	10	72	1			47	10	65	6			30	4	44	1		
,, 15 ...	53	11	73	2			47	5	66	5			30	6	45	10		
,, 22 ...	53	10	74	8			47	2	67	3			30	7	46	5		
,, 29 ...	54	9	75	10			47	5	67	5			30	10	47	4		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of June, 1915, 1916. and 1917.

	WHEAT.			BARLEY.			OATS.		
	1915.	1916.	1917.	1915.	1916.	1917.	1915.	1916.	1917.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	58 5	50 0	79 9	35 1	51 0	66 2	33 5	33 5	55 4
Norwich ...	58 5	49 6	77 11	33 4	48 10	65 2	31 9	31 4	55 2
Peterborough	54 8	47 9	78 1	33 3	48 8	65 1	31 8	31 8	55 1
Lincoln ...	56 2	50 3	77 8	33 8	49 9	68 0	31 4	32 4	54 8
Doncaster ...	54 4	50 1	77 11	...	...	...	31 3	31 7	54 11
Salisbury ...	57 4	49 4	78 2	34 8	50 1	65 8	31 8	31 6	55 1

Statement showing the Average Price of BRITISH CORN, per Quarter (Imperial Measure), for the Quarter ending Midsummer, 1917, pursuant to the Corn Returns Act. 1882.

Wheat.	*Barley.*	*Oats.*
s. d.	s. d.	s. d.
79 9 ..	69 1 ..	55 9

ADDITIONS TO THE LIBRARY.

Agriculture, General and Miscellaneous—

Cooley, E. G.—Vocational Education in Europe. 2 Vols. (347 + 177 pp.) Chicago: The Commercial Club of Chicago, 1912, 1915. [37(02); 371.]

Orr, J.—Agriculture in Oxfordshire. (239 pp.) Oxford: Clarendon Press, 1916. 8*s.* 6*d.* net. [63(42).]

Castle, W. E.—Genetics and Eugenics. A Text Book for Students of Biology and a Reference Book for Animal and Plant Breeders. (353 pp.) Cambridge (Mass.): Harvard University Press; London: Humphrey Milford, Oxford University Press, 1916. $2.00 [575.1.]

Kraemer, H.—Applied and Economic Botany. (822 pp. + 424 Plates.) Philadelphia: published by the Author, 1916. [58.11.]

Savage, G.—Les Deux Agricultures: France et Allemagne. (244 pp.) Paris: 9 rue Caroline; sold by the Author, 1916. [63(43); 63(44).]

Falconer, J.—The Ploughing up of Grass Land and its Subsequent Treatment. (63 pp.) [Journal of the Farmers' Club, March, 1917.] London: Farmers' Club. 6*d.* [63.196.]

Porter, J.—A Big Stride in Agricultural Improvement. (32 pp.) Hereford, 1916. 6*d.* net. [63.3(04).]

Horticulture—

Scarlett, J. W.—Suggestions for Modifying the Cost of Fruit and Vegetable Distribution. (16 pp.) London: "The Fruitgrower," 1916. 3*d.* [63.41-198.]

Harriman, Miss G.—Market Gardening for Ladies. (54 pp.) Derby: F. Carter, 1916. 1*s.* 6*d.* [63.51(02).]

May Byron's Jam Book. (276 pp.) London: Hodder & Stoughton, 1916. 2*s.* 6*d.* net. [664.85.]

Armstrong College.—College Bull. 14:—The Sowing Down of a Garden Lawn at Armstrong College. (4 pp.) Newcastle-upon-Tyne, 1916. [63.52.]

The Sterilization of Fruit and Vegetables for the Home. (22 pp.) London: Central Committee for National Patriotic Organisations [1916]. 1*d.* [664.8.]

The Sterilization of Fruit and Vegetables for the Market. (15 pp.) London: Central Committee for National Patriotic Organisations [1916]. 1*d.* [664.8.]

Zavalla, J. P.—The Canning of Fruits and Vegetables. (214 pp.) London: Chapman & Hall, 1916. 10*s.* 6*d.* [664.8.]

Sutton and Sons.—The Culture of Profitable Vegetables in Small Gardens. (40 pp.). London: Simpkin, Marshall, Hamilton, Kent & Co., 1917. 6*d.* net. [63.51(04).]

Davidson, H. C.—Rational Fruit Culture. (127 pp.) London: "Garden Life" Press, 1917. 2*s.* 6*d.* net. [63.41(02).]

Cowley, H.—Vegetable-Growing in War-Time. (30 pp.) London: "Country Life" Offices, and G. Newnes, Ltd., 1917. 6*d.* net. [63.51(04).]

Green, F. E.—Everyman's Land and Allotment Book. (192 pp.) London: "The Daily Chronicle, 1917. 7*d.* net. [63(022).]

Gentle, A. G.—Practical Potato-Growing and Storing. (32 pp.) Little Gaddesden: published by the Author, 1917. 1*s.* post free. [63.512(04).]

Wright, W. P.—Food, Fruit, and Flowers. (336 pp.) London: J. M. Dent & Sons, 1917. 5*s.* net. [63.5(02).]

Newsham, J. C.—The Potato Book. (92 pp.) London: C. A. Pearson, 1917. 1*s.* net. [63.612(02).]

Brett, W.—The Allotment Book. How to Make the Most of your Land. (92 pp.) London: C. A. Pearson, 1917. 1*s.* net. [63.51(02).]

Thomas, H. H.—Gardening: A Complete Guide. (152 pp.) Cassell & Co., 1917. 1*s.* 3*d.* net. [63.5(02).]

Spence, Major D. A.—Potatoes. (23 pp.) [Journal of the Farmers' Club, January, 1917.] London: Farmers' Club. 6*d.* [63.512(04).]

Cambridge University School of Agriculture.—Potato-Growing, Preparation of the Ground by "Sheep Folding." (4 pp.) Cambridge, 1917. [63.512(04).]

Field Crops—

Carleton, M. A.—The Small Grains. (699 pp.) New York: The Macmillan Company, 1916. 7*s.* 6*d.* [63.31(02).]

Ellis, Mrs. J. D.—Herbs used in Medicine (First Series), with Descriptive and Explanatory Notes. (32 pp. + 16 Plates.) London: National Herb-growing Association, 1917. 3*s.* net. [63.348.]

West of Scotland Agricultural College.—Bull. 78. Notes on Medicinal Plants. (100—149 pp.) Glasgow, 1917. [63.348.)

Bangor, University College of North Wales, Department of Agriculture.—The Improvement of Rough Pastures. (7 pp.) [1917.] [63.33-16.] The Formation of Pastures. (4 pp.) [1917.] [63.33(*b*).]

Plant Diseases—

McAlpine, D.—Bitter Pit Investigation: The Control of Bitter Pit in the Growing Fruit. Third Progress Report, 1913-14. (176 pp. + XXXVII. Plates.) The Experimental Results in their Relation to Bitter Pit and a General Summary of the Investigation. Fourth Report, 1914-15. (178 pp. + XL. Plates.) Melbourne: Government Printer. [63.21.]

Rome, Institut International d'Agriculture.—La Lutte contres les Sauterelles dans les divers Pays. (186 pp.) Rome, 1916. Fr. 3.60. [63.27.]

Shipley, A. E.—Studies in Insect Life and other Essays. (338 pp.) London: T. Fisher Unwin, 1917. 10*s.* 6*d.* net. [59.57.]

Eastern Counties Province.—Leaflet 2.—Finger-and-Toe. (3 pp.) Cambridge, 1917. [63.24.]

Live Stock—

Jones, C. Bryner (edit.).—Live Stock of the Farm. Vol. VI. Bees, Goats, Dogs, Ferrets, Asses and Mules. (199 pp.) London: Gresham Publishing Company, 1916. 42*s.* net the 6 vols. [63.6(03).]

Leeds University, Agricultural Dept.—Bull. 73:—Composition, Nutritive and Manurial Values of Farm Foods. [3rd revision.] Leeds, 1916. [63.604(*a*).]

U.S. Department of Agriculture.—Farmers' Bull. 720:—Prevention of Losses of Live Stock from Plant Poisoning. (11 pp.) Washington, 1916. [619(04); 63.25.]

Live Stock—

U.S. Department of Agriculture, Office of the Secretary.—Report No. 112 :—Meat Situation in the United States. Part IV., Utilization and Efficiency of Available American Feed Stuffs. (27 pp.) Washington, 1916. [63.604(*a*).]

Massé, A.—Le Troupeau Français et la Guerre : Viande Indigène—Viande Importée. (382 pp.) Paris : Librairie Agricole de la Maison Rustique, 1915. 3 *fr.* 50. [63.6(44).]

Bull, S.—The Principles of Feeding Farm Animals. (397 pp.) New York : The Macmillan Company, 1916. 7*s.* 6*d.* net. [63.604.]

Deutsche Landwirtschafts-Gesellschaft.—Arbeiten. Heft 270 :—Die Bedeutung des Schweines für die Fleischversorgung. (381 pp. + 32 Plates.) Berlin : Paul Parey, 1914. 10 M. [63.64(02).]

Northumberland County Council, Agricultural Experiment Station, Cockle Park. Bull. 25 :—Palm Kernel Cake, Palm Kernel Meal, and Cocoanut Cake, compared with Soya Cake, for Fattening Cattle, young Store Cattle, and Fattening Sheep, 1915-16. (8 pp.) Newcastle-on-Tyne, 1916. [63.62 ; 63.33.]

Dairying and Food, General—

Murray, J. Alan.—The Economy of Food : A Popular Treatise on Nutrition, Food and Diet. (253 pp.) London : Constable & Co., 1916. 2*s.* net. [612.39.]

Guest, Hon. Mrs. Lionel.—The Little Cow and Milk Book. (24 pp.) London : Central Committee for National Patriotic Organisations. [1916] 2½*d.* post free. [63.70(04).]

Wibberley, T.—Continuous Cropping and Tillage Dairy Farming for Small Farmers. (186 pp.) London : C. A. Pearson, 1916. 2*s.* 6*d.* net. [63.3(02) ; 63.70(02).]

Guest, Hon. Mrs. Lionel.—Cow and Milk Book. (175 pp.) London : John Lane, 1917. 1*s.* net. [63.711.]

Larson, C. W.—Milk Production Cost Accounts : Principles and Methods. (60 pp.) New York : Columbia University Press, 1916. [63.714.]

Birds, Poultry, and Bees—

Poultry Houses and Appliances. (156 pp.) London : Cassell, 1917. 1*s.* 3*d.* net. [63.6 ; 69.]

Paynter's System of Poultry Rearing, or £500 a Year from Hens. (162 pp.) London : "Country Life" Offices, 1917. 3*s.* 6*d.* net. [63.651(02).]

Wallace, R.—Heather and Moor Burning for Grouse and Sheep. (88 pp. + XV. Plates.) Edinburgh : Oliver & Boyd, 1917. 2*s.* 6*d.* net. [63.9.]

Forestry—

Taylor, J. L. B.—Handbook for Rangers and Woodsmen. (420 pp.) New York : John Wiley & Sons. London : Chapman & Hall, 1917. 11*s.* 6*d.* net. [63.49-19.]

Economics—

Ashby, A. W.—The Rural Problem. (40 pp.) London : National Adult School Union, [1916]. [338.1.]

Hall, A. D., and others.—British Agriculture, The Nation's Opportunity, being the Minority Report of the Departmental Committee on the Employment of Sailors and Soldiers on the Land, with an Appendix on the Reclamation of the Land. (168 pp.) London : John Murray, 1917. 3*s.* 6*d.* net. [338.1.]

Radford, G.—State Services. (142 pp.) London : Smith, Elder & Co., 1916. 3*s.* 6*d.* net. [338.98.]

Ashby, A. W.—Allotments and Small Holdings in Oxfordshire. A Survey made on behalf of the Institute for Research in Agricultural Economics. University of Oxford. (198 pp.) Oxford : Clarendon Press, 1917. 5*s.* net. [338.38(42).]

Radford, G.—Agricultural Co-operation and Organisation. 2nd Edition, revised. (154 pp.) London : Hodder & Stoughton, 1917. 3*s.* 6*d.* net. [334(02).]

Ponsonby, T. B.—Agricultural Labour. Standardisation as a Means of Improving the Conditions of Rural Employment. (29 pp.) Dublin : The Co-operative Reference Library, 1917. 6*d.* net. [331.]

Turnor, C.—The Land and the Empire. (144 pp.) London : John Murray, 1917. 3*s.* 6*d.* net. [338.1.]

(4960) Wt. P. 14—99. 7.750. 7/17. J. T. & S., Ltd.

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THE IMPROVEMENT OF LIVE STOCK IN ENGLAND AND WALES.*

In the year (1st April, 1916—31st March, 1917) covered by this Report the effects of the War upon agricultural conditions have become much more apparent. The scarcity of labour, the high price of feeding stuffs, and the difficulty often experienced in obtaining suitable sires have, to some extent, checked the development of the Board's Live Stock Scheme in some parts of the country.

The Scheme to improve the ordinary farm stock of the country was brought into operation shortly before the outbreak of War, and if before the War it was important that ignorant and careless stock-breeders should be educated to breed, rear and feed their animals on more scientific lines, it appears to be far more necessary at the present time that this work shloud be speeded up, and continue to receive Government assistance and supervision.

It is an acknowledged fact that the land in this country could be so cultivated that a much larger acreage of wheat and oats could be grown and a larger yield per acre could be produced, and it is equally important and quite possible that not only a much larger head of profitable stock should be bred and maintained in the future, but that the producing capabilities of our farm stock should also be so increased and improved as to yield on the average a far larger quantity of meat or milk per head than is at present the case.

The more grass land that is converted into arable the greater need there will be for more agricultural horses, notwithstanding

* Owing to the War, this article replaces the Annual Report on the Live Stock Scheme, which will, therefore, not be issued separately.

the assistance which may be afforded to farmers in the supply of mechanical power by means of motor tractors, ploughs, etc., and if an increased acreage and yield of cereals is to be obtained it will be necessary to increase our live stock as well in order to fertilise the soil, for farmyard manure can rarely be replaced entirely by artificial manures.

One of the main objects of the Scheme is to improve the quality of farm live stock, but there is evidence that it will be a means of improving their vitality as well. In many districts farmers have been and are still content to keep for breeding purposes animals which are descended from ancestors which have been in-bred for some considerable time. No record is kept of the pedigree of these animals. In many cases, even the sire or dam is unknown, and their owners have not recognised the necessity of introducing fresh blood into their herds or flocks. The result is that animals which are too closely related are often mated together and produce offspring which are constitutionally weak and which often fail to thrive or mature in a satisfactory manner.

Under the Scheme the subsidised sires are a means of bringing a much needed "out-cross" of blood into many remote districts where in-breeding is very prevalent; doubtless, however, there still remain numerous localities not so distant where fresh blood is also needed. A society using a "Government" sire is compelled to make a change of blood before any danger of in-breeding arises, and the Live Stock Officer takes care that a new sire is not too nearly related to its predecessor. It is hoped, therefore, that in time the Scheme may tend to improve the strength and vitality of our live stock as well as their quality and meat- and milk-producing capacities, and that it will prove to the careless or ignorant stock-breeder that the mating of animals in a haphazard manner is economically unsound.

As was stated in last year's Report* most of the heifer calves sired by bulls located under the Scheme are either retained by their owners for breeding or are sold for that purpose, and the demand for such calves is greater than the supply. There is evidence, too, that many of the best of the male calves are sold for future use as bulls. This is an indication that the ordinary farmer is beginning to recognise the truth of what the breeders of pedigree stock have always maintained, *i.e.* that a well-bred animal is more profitable than a mongrel.

* See Journal, Aug., 1916, p. 417.

It is very desirable that this view should become general, as at the present time it is of national importance that the greatest care should be taken in the selection and mating of breeding animals on farms. The number of our live stock is almost certain to be reduced owing to the War, and those of them which can be spared for breeding during the present crisis ought to be the choicest of their kind. It is expedient therefore, that breeders, whether they own pedigree animals or not, should set aside and use for stud purposes those animals which are most likely to beget healthy, strong offspring, capable of producing the maximum amount of meat, milk or wool, or, in the case of horses, progeny that are most likely to grow into the class of animal best suited to the agricultural, military and commercial needs of the country. By careful selection and mating the studs, flocks and herds, which are a great national asset, can be maintained and improved to the benefit of the farmers and the welfare of the nation.

For the year under review the amount of the grant made available from the Development Funds was as follows :—

	£
Boars	1,000
Bulls	12,550
Heavy Horses	6,050
Milk Recording	1,500
	£21,100

and the progress that the Scheme has made during the three years it has been in existence is shown in the following table : —

Year (1st April to 31st March.)	Boars.			Bulls.			Horses.		Milk Recording.	
	Societies.	Individuals.	Boars.	Societies.	Individuals.	Bulls.	Societies.	Stallions.	Societies.	Cows.
1914–15 ..	100	Nil.	107	285	26	370	65	72	16	7,331
1915–16 ..	180	Nil.	193	489	28	633	88	97	20	9,811
1916–17 ..	186	15	216	543	15	659	93	108	22	12,950

Unfortunately, many societies have been compelled to cease operations owing either to members being called up for military service, to shortage of labour, or to other war difficulties, but in spite of abnormal conditions, development continues to be shown, and the progress made may be regarded as not unsatisfactory.

Grants for Bulls.—This section of the Scheme has continued to prove popular and successful. The number of sires located has increased from 633 in 1915–16 to 659 in the year covered

by this Report. There has been, in some instances, a marked increase in the prices paid for these sires, and although this can be attributed in some measures to the high prices ruling for live stock, there is no doubt that the Scheme is tending to increase the demand for well-bred sires throughout the country. The number of changes of bulls that have taken place during the year has revealed this increased demand. In connection with the prices paid for subsidised bulls it is of interest to record that a bull, which was used by a society under the Scheme, and which was bought for that purpose for 44 guineas, was sold for export for £120, and eventually resold in the Argentine for £426.

Representations have been received from societies urging the prohibition of the use of inferior or unsound bulls, and while the Board are of opinion that the time is not yet ripe for action in the direction suggested they regard the representations as evidence of a growing appreciation both of the necessity and of the desirability of using only sound and high-class animals. As evidence, too, of the awakening interest in the proper breeding of live stock there is a growing desire for the establishment of calf registers in connection with milk-recording societies and bull societies.

The number of bulls located at the close of the year 1916–17 was 659, of which 644 were provided by 543 societies, and the remainder by 15 individual owners. Of these bulls 484 were located in England and 175 in Wales. The number of bulls actually purchased and owned by societies was 63, the other 581 being hired by societies from bull owners.

The average prices paid for bulls were as follows:—£46 15*s.* 6*d.* for Devons, £45 10*s.* for Shorthorns, £44 15*s.* for Lincoln Reds, £42 12*s.* for Herefords, £40 6*s.* for South Devons, and £32 9*s.* 6*d.* for Welsh Blacks. The highest price paid for a bull was £120 for a Shorthorn.

The service fees of these bulls varied from 2*s.* 6*d.* to 10*s.* 6*d.*

Of the bulls located: 426 were Shorthorn, 67 Hereford, 63 Lincoln Red, 46 Devon, 36 Welsh Black, 13 South Devon, 4 Aberdeen Angus, 2 Guernsey, 1 Jersey and 1 Sussex.

Grants for Boars.—The number of boars located has increased from 193 to 216 during the year 1916–17. It has been found increasingly difficult to form societies, and in view of the high price of feeding stuffs and the scarcity and enhanced value of suitable boars, there has been some hesitation among existing societies as to continuing their operations. It was thought,

therefore, that if grants were made to individual boar owners, as is done in the case of bulls where societies cannot be formed, there might be some inducement to owners of good boars to continue to keep their animals and to let their neighbours have the use of them for their sows. Towards the end of the year the Board decided accordingly to award "individual" grants, and a number of boars have been located already under this arrangement.

Of the 216 boars located: 97 were Large White, 50 Large Black, 22 Gloucester Old Spots, 14 Berkshire, 17 Lincoln Curly Coat, 10 Middle White, 4 Cumberland and 2 Large White Ulster, and the average price was £8 7*s.* 6*d.* per boar. The service fees varied from 1*s.* 6*d.* to 6*s.*

Grants to Heavy Horse Societies.—The amount of the grant available for heavy horse breeding was reduced. It was thought advisable to reduce the amount of the grant awarded to each society rather than to reduce the number of societies receiving a grant. This reduction had little, if any, deterrent effect on the activities of the various societies, and, as in previous years, the number of applications received by the Live Stock Committees was greater than could be met. The number of societies operating in 1916 was 93 with 108 stallions, as compared with 88 societies and 97 stallions in 1915. The number of mares served by the 108 stallions was 9,995, an average of 92 mares per stallion. Assisted nominations (*i.e.* payments not exceeding half the normal service fee) were paid by the Board in respect of 2,181 of the mares which belonged to farmers whose holdings did not exceed 100 acres. The average hiring fee paid for the stallions was £244, and the average service fee approximately £2 11*s.*

The above figures do not include the operations of the Cumberland and Westmorland Heavy Horse Society. As was pointed out in the last Report, the procedure followed in these two counties differs somewhat from that adopted in the rest of the country. Assisted nominations were issued in respect of 394 mares belonging to members of the society, and those mares were served by 50 selected stallions.

Milk-recording Societies.—In no other section of the Scheme have the difficulties arising out of the War been so apparent as in that of milk recording.

Most dairy farmers and members of their family, male and female, are now obliged to do much more manual labour, as so many of their skilled and intelligent labourers and milkers

have been called up. Successful milk recording entails careful, regular, and intelligent weighing of the milk and entering of the records, and even members of societies, who are keen on milk recording, have found it very difficult to find time for the proper carrying out or supervision of the work during the past year, and new members have been very chary of joining societies during the War. The farmer, as a rule, is not fond of clerical work, and until he has had some experience of milk recording he is apt to think it involves much more writing and "figuring" than is actually the case.

The success of a milk-recording society depends largely on the keenness and intelligence of its secretary and recorder, and especially of the latter, as the members as a rule look to him to conduct the operations of the society. The difficulty in obtaining and retaining suitable recorders has been especially great, as so many of them were young men of military age. Young women have in some instances undertaken this work, but the early hours and long journeys on country roads make it a very arduous task for them during the winter.

Added to the above difficulties there was a feeling of uneasiness among milk producers as to whether they would be able to conduct their business at a profit, and many were inclined at one time to sell all or a portion of their herds, and in view of all the adverse circumstances it may be regarded as satisfactory that there has been an increase in the number of societies and in the number of cows owned by members.

The number of milk-recording societies in operation at the end of the year under review was 22 as compared with 20 during the previous year. There were 441 members and they owned between them 495 herds, comprising 12,950 cows. An increase on last year's figures of 91 members, 97 herds and 3,150 cows.

The number of milk-record certificates issued during the year was 834. The highest yield recorded was one of 17,740 lb.; two cows gave yields of approximately 15,500 lb., and many others had records of over 10,000 lb.

As an illustration of the influence of the Scheme in securing an increased production of milk, it may be of interest to record that a society whose members owned 464 cows increased its milk production during its second year of operations by 36,000 gal. though the number of cows was only increased by two. An increase of milk in one society to a value of approximately £1,800 is good business both from the national and from the dairy farmers' point of view.

The following are the principal memoranda and forms used in connection with the live-stock operations of the Board, and copies of them can be obtained free of charge on application to the Secretary, Board of Agriculture and Fisheries, Whitehall, Place, London, S.W. 1. :—

L. 1.—Memorandum on the Live Stock Scheme.
L. 2.—Regulations as to Bull Grants.
L. 3.—Regulations as to Heavy Horse Grants.
L. 4 and L. 79.—Regulations and memorandum as to Milk Record Grants.
L. 11.—Regulations as to Boar Grants.

APPENDIX.

Showing the Amount of the Grants Authorised and the Number of Sires and Milk Recording Societies Subsidised in 1916-17.

Province and District.	Boars.		Bulls.		Horses.		Milk Recording.		Total Authorised for Province.
	Amount Authorised.	Sires Subsidised.	Amount Authorised.	Sires Subsidised.	Amount Authorised.	Sires Subsidised.	Amount Available.	Societies Subsidised.	
	£		£		£		£		£
1. Armstrong College ..	39	4	240	15	610	*5	200	2	1,089
2. Manchester University	48	8	1,250	48	120	2	175	2	1,593
3. Leeds University	81	15	1,094	51	605	12	50	1	1,830
4. Harper Adams College ..	60	15	1,107	45	320	8	nil	nil	1,487
5. Midland College ..	66	21	1,080	68	425	6	175	4	1,746
6. Cambridge University	132	9	1,000	35	950	18	300	5	2,382
7. South Eastern College ..	57	12	678	30	260	5	100	1	1,095
8. Reading College ..	147	20	918	42	430	8	150	2	1,645
9. Bristol University	118	45	1,495	92	710	17	350	5	2,673
10. Seale-Hayne College ..	60	10	928	58	360	5	nil	nil	1,348
England	808	159	9,790	484	4,790	86	1,500	22	16,888
11. Aberystwyth College ..	108	34	1,605	104	674	11	nil	nil	2,387
12. Bangor College ..	84	23	1,155	71	586	11	nil	nil	1,825
Wales ..	192	57	2,760	175	1,260	22	nil	nil	4,212
England and Wales..	1,000	216	12,550	659	6,050	108	1,500	22	21,100

* Exclusive of the Cumberland and Westmorland Society.

THE "BLOSSOM WILT AND CANKER" DISEASE OF APPLE TREES.*

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A DISEASE of apple trees, whose virulence has been steadily increasing for several years in the south-eastern counties of England, has recurred during the present summer with greater intensity than in previous seasons, the result being that on many fruit farms the crop from the more susceptible varieties of apple trees has been reduced to one quarter or even less. Specimens of affected trees have been received at Wye College not only from the south-eastern counties but also from other parts of the country, so that although the greatest amount of damage appears to have been caused in Kent and Sussex the disease is probably widely distributed.

The variety of apple that is found to be most readily attacked is Lord Derby, but Cox's Orange Pippin, James Grieve and Ecklinville Seedling are often severely damaged. The disease occurs also on the following varieties :—Duchess of Oldenburg, Worcester Pearmain, Allington Pippin, Early Julyan, Lane's Prince Albert, Lord Grosvenor, Prince Bismarck, Chelsmford Wonder, Newton Wonder, Domino, Beauty of Bath, Warner's King, Keswick Codlin, Bramley's Seedling, Duchess' Favourite, Rival, Fearn's Pippin, Dartmouth Crab, Ribstone Pippin and Hanwell Souring. On the very susceptible varieties, it is not uncommon to find from 50 to 75 per cent. of the flowering spurs killed by this disease in a single season.

The following extracts from letters received this year indicate the extent of the damage that may occur where no efforts are made to keep the disease under control :—

" My Derbys are badly attacked and Keswicks a little. I should say I lost quite 150 bush. of Derbys ; I sent 13 bush. to market. My Bramleys, Red Allenbury, Besspools, Sourings and Cox's Pomona were quite free although in the same orchard."

" Many trees after being affected three or four years have been practically killed. The Derbys' crop has been cut down to half or less. I have grubbed out 600 trees."

* A more detailed description of this disease and of the fungus causing it appears in *The Annals of Applied Biology*, Vol. III., No. 4, April, 1917, pp. 159–204.



FIG. 1.



FIG. 2.



FIG. 3.

"The disease is worst in the Ecklinvilles, some trees of which last year bore scarcely any crop at all on account of it."

"The enclosed apple blossom is from Lord Derby Apple—it is a specimen of how all the Derby trees are going on our farm, and some trees are practically dying."

"In my own experience this disease has got rapidly worse year by year; last year it was much worse than I have ever seen it before. It is difficult to supply an estimate of damage done, but I should say on Early Julyan it scarcely affected the crop at all, on Ecklinville Seedling damage was done to about 10 per cent. of the crop, while on Lord Derby, in one piece 30 per cent. of the crop was lost and also 30 per cent. of the tree had to be cut away last year."

It will be seen from these extracts that the Lord Derby variety is remarkably susceptible, to attack from this disease. In the Weald of Kent this variety is extensively grown, and in those orchards where the disease has been allowed to develop unchecked for several seasons the trees are now unproductive, and in many cases it has been found necessary to top-graft them with a more resistant variety. For this purpose Bramley's Seedling has usually been employed, as this is not only a strong growing variety, but is much less liable to become infected with "blossom wilt," although observation and experiment have proved that it is not entirely immune. This comparative immunity of Bramley's Seedling was shown in a striking manner in a mixed orchard in the Weald where a tree of this variety was growing in close proximity to several badly infected Lord Derby trees, each bearing some hundreds of dead spurs and cankers. A thorough search only revealed one such spur on the Bramley's Seedling.

Trees of all ages suffer from this disease. On large standard Lord Derbys it frequently causes great damage because it is easily overlooked in the first stages of the disease, or if noticed at all is not considered of sufficient importance to warrant any special treatment, and neglect is certain to lead to worse damage during the succeeding season. Younger trees of this variety are equally susceptible, and infection often causes the death of some of the main limbs. In Fig. 1 is shown a portion of a large canker obtained from a young Lord Derby tree about 6 years old; the canker had girdled the branch for a considerable distance and that portion above the canker was dead. Fig. 6 shows the main stem of a young cordon apple tree (var. Rival) obtained from the fruit plantation at Wye College during the first summer after the trees were planted out. The tree had

become infected through a spur near the middle of the stem, and the resulting canker caused the death of the upper half of the tree. In this case there were no other diseased trees in the immediate neighbourhood, so infection must have arisen from wind-borne spores, which had been carried for some distance.

The first evident symptom of the disease is the "blossom wilt" condition. About a fortnight after the flowers begin to open on affected trees there are to be seen fruiting spurs on which the leaves are beginning to wilt; within a day or two these drooping leaves become brown and withered, usually with incurved margins, thus showing their under-side; all the flowers of such trusses are brown and dead. This condition is in itself serious, since in severe attacks from a half to three-quarters or more of the fruiting spurs may be killed in this way; it is frequently followed, too, by the more serious "canker" condition. The fungus causing the disease advances along the tissues of the spur, and if it reaches the branch will continue to grow first in the bark and later in the wood until in certain cases the branch is completely girdled; that portion above the canker then dies. In Fig. 7 is seen a canker that had just girdled the branch, infection having arisen through the truss of flowers on the left; the leaves at the upper end of the branch were at this stage turning yellow and wilting.

Fig. 4 shows that several trusses on a branch may become infected; in this particular case the terminal portion of the branch was quite dead by reason of the cankers developing round the bases of the affected trusses lower down. This specimen also illustrates the rapidity with which the fungus travels down the spur into the branch. The tree from which it was taken began to flower that year about 1st May, and the first signs of wilting occurred about the middle of the month, while the condition shown in the illustration was induced by 31st May. Fortunately such a rapid development of the fungus in the spur or branch tissues continues for a few weeks only, and generally its further extension into the tree is arrested about the end of June; cankers formed by that time show no further increase in size either that season or subsequently.

During dry weather the fungus causing the blossom wilt does not, as a rule, appear at the surface of the diseased flowers or spurs. In a moist atmosphere, however, it may be found on the flowers and flower stalks as small rounded pustules consisting of numerous chains of spores (conidia). On the surface of the spurs and cankers the fungus does not make its



FIG. 4.



FIG. 5.



FIG. 6.

appearance until much later in the year. During December the immature pustules may be found bursting through the bark and they continue to increase in number during the winter months. In spring these pustules become powdery with spores, and by the time the trees come into bloom they are liberating myriads of these reproductive bodies, many of which fall into the flowers as they open and so produce a new infection resulting in blossom wilt (see Fig. 5).

Since these spores are exceedingly minute (averaging about $\frac{1}{2500}$ of an inch in length) they are easily carried in the air for considerable distances and so give rise to outbreaks of the disease in plantations hitherto free from it. It is found, however, that the wilted trusses are by far the most numerous in the vicinity of cankers or of dead spurs bearing pustules, those trusses situated immediately below such spurs or cankers being particularly liable to infection. Thus, in general, it may be stated that, although infection must at times take place through spores which are carried by the wind from one tree to another, or from one plantation to another, the great majority of wilted trusses on a tree are infected from pustules of the fungus borne on spurs and cankers on the same tree. Growers have sometimes stated that a severe outbreak of blossom wilt has occurred on trees where it had not been previously observed. When such a case has been investigated a careful search on the tree has revealed the presence of a number of dead spurs bearing the fungus, these being the result of an attack during the preceding year and serving as sources of infection for the new crop.

The fungus causing the blossom wilt is *Monilia cinerea*, a form which is closely related to but quite distinct from that which causes the " brown rot " of the ripening fruit and which is very destructive to stored apples. Brown-rot (*Monilia fructigena* = *Sclerotinia fructigena*) is commonly found on apples still attached to the tree or on the fallen fruit, and is seen as numerous yellowish pustules bursting through the skin and growing usually in concentric circles ; the infected apples which remain on the tree eventually become " mummified." The grey *Monilia cinerea* is invariably obtained from wilted flowers and from dead spurs infected through the flowers ; so far as observations in Kent have gone it has not been found on the mature apples in the open* though occasionally it occurs on the young fruit. This *Monilia* obtained from diseased spurs

* Experiment has shown that it readily causes a rot of apples when these are ***artificially inoculated*** with the fungus.

and cankers has been examined in the open and in the laboratory, and numerous pure cultures have been prepared for comparative studies and for experimental purposes. It differs from *M. fructigena* in its grey pustules and smaller spores; it is also distinguished by its different habit of growth when growing on sterilised media in the laboratory.

That the fungus is the direct cause of the blossom wilt has been proved by experiments carried out in the greenhouse and in the fruit plantation at Wye College during the season of 1916, and these have been repeated in the open this year. Apple flowers were inoculated with spores taken from pure cultures of the fungus; these spores were placed on the stigmas of the flowers, and the result was that in about a fortnight the typical blossom wilt condition appeared in the majority of the inoculated spurs. In Fig. 8 is seen the result obtained within 16 days after placing spores from a pure culture upon the stigmas of a single flower in the truss on the left; this truss, with its drooping, withered flowers and leaves, shows the typical symptoms of the blossom wilt; the one on the right was used as a control (*i.e.* it was not treated in any way). In another case a truss similarly infected was killed in 12 days, and four days later a canker was to be observed on the stem round the base of the dead spur. Figs. 9, 10, and 11 also show the result brought about by inoculating the flowers with spores of the fungus. Near the centres of Figs. 9 and 10 is a cluster of six trusses of blossom; in a single flower of each of four of these the spores were placed. After about three weeks the result was as shown in Fig. 9. Nine days later the fungus had invaded the branch from the spurs and formed cankers, so that the leaves at the upper end of the branch began to wilt also (Fig. 10). At this stage the organism was in the form of fungal threads (*mycelium*) within the tissues of the spur and branch. During the succeeding winter, however, the fungus appeared at the surface of the bark in the form of powdery pustules, and Fig. 11 shows the same branch the following spring.

It is found that when the spores of this fungus are placed in water they germinate within a few hours, producing a germ tube which soon becomes branched, so probably the tissues of the infected flowers are invaded shortly after the spores fall on them. In the experiments carried out at Wye College the spores germinated on the stigmas and the germ tubes travelled down the styles to the centre of the flower, then along the flower stalk into the spur. The other flowers and the leaves borne on that spur then began to wilt. This occurred in from



FIG. 7.



FIG. 8.

11 to 15 days after inoculation, so that the first conspicuous symptom of the disease, that is the wilting of the leaves round the base of a truss of flowers, occurs about a fortnight after infection has taken place.

When the infected flowering spur is 3 or 4 in. long the development of the fungus is usually arrested before it can reach the branch itself, but when the spur is a short one ($\frac{1}{2}$ in. to 1 in. in length) the branch is soon invaded and a canker is formed.

CONTROL MEASURES.

In considering the best method for controlling this disease it is necessary to emphasize the following points :—

(1) Infection occurs through the open flowers.
(2) The leaves of affected spurs begin to wilt about a fortnight after the flowers are infected.
(3) Infection arises almost exclusively from the pustules of the fungus produced on spurs and cankers.
(4) When an infected truss of flowers is borne on a short spur the fungus soon invades the branch, itself producing a canker which may completely girdle it and so kill that portion of the branch above the canker.
(5) The cankers do not increase in size after about the end of June.
(6) The dead spurs and the cankers formed in any one season produce during the following winter and spring a crop of spore-bearing pustules, which are ready to infect the flowers as they open in spring.

There are three possible ways of treatment :—

(*a*) The removal of the cankers and all infected spurs.
(*b*) Spraying to destroy the pustules.
(*c*) Spraying to prevent the pustules from liberating their spores during the period that the flowers are open.

Since infection takes place through the flowers it is evident that a spray fluid cannot be employed for the purpose of forming a protecting film over the organs liable to infection, and spraying experiments carried out with the object of either killing the pustules or preventing them from shedding their spores have not yielded satisfactory results ; so at present fruit growers are strongly advised not to attempt to control this disease by spraying as they are extremely likely to waste their time and money. It has been found that the washes generally used for checking the spread of fungus disease, as for instance, lime-sulphur and Bordeaux mixture, are useless as they fail to wet the pustules.

To wet the pustules completely mixtures containing soap were found to be necessary, and several such fluids, including Bordeaux mixture, soda Bordeaux (usually called Burgundy mixture in this country), cupram and ammonium sulphide, each containing 1 per cent. soft soap, were tested. Under laboratory conditions these spray fluids killed the spores at the surface of the pustules, but when the spraying was carried out in the open a few days before the flowers expanded, it was found that the pustules grew through their sterile surface layer and became powdery by the time the flowers opened. It should be remarked, however, that the weather conditions during the spring of this year* were very favourable to the development of the fungus. Spraying with a lime wash was not successful either, for although some of the pustules became covered, or partially covered, with a coating of lime, the fungus grew through this during a period of wet weather. The most promising results were obtained with a solution of caustic soda containing soft soap, used as a "winter wash." Under certain conditions this destroyed the pustules, but when tried on a practical scale in an orchard the result was not such as to warrant recommendation. Even were a mixture discovered capable of effectually controlling the blossom wilt disease, spraying should only be resorted to as a temporary measure—*i.e.* as a measure to be employed on neglected trees which have become so infested with the disease that with the available labour it is impossible to cut out all the parts which serve as sources of infection—for in general it is a bad practice to leave dead branches or twigs on the trees.

The only method of completely eradicating the disease from an orchard is by the removal and destruction of all infected spurs and cankers. This may be done either in summer or in winter. As already indicated, the disease is first made noticeable by the wilting of the trusses of flowers and of the leaves around them. If the spurs bearing such affected flowers are cut away as soon as the leaves wilt, the fungus is prevented from reaching the branches and producing cankers. Such treatment is by far the best, but in order to carry it out several examinations of the trees would be required during the third and fourth weeks after the flowers first opened. This would scarcely be practicable except on young trees and in small plantations or in gardens. Usually, on large fruit farms it would be possible

* Just before the apple trees came into flower there was a week of very wet weather which caused the pustules to become larger and more powdery; this was followed by a period of dry weather with breezes which dispersed the spores.



FIG. 9



FIG. 10.

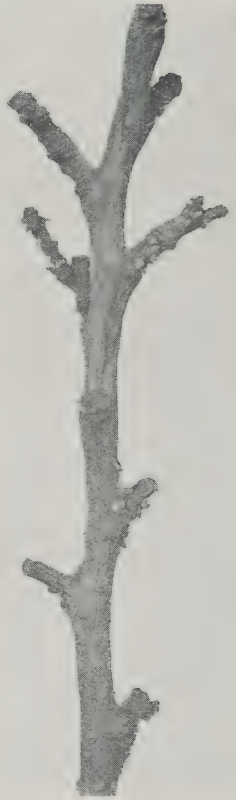


FIG. 11.

to examine the trees and cut out diseased portions once only during the season, and the best time for the operation is about the fifth week after the trees come into bloom ; by that time all the infected trusses can be recognised by their withered leaves, and although in some cases cankers will have formed already, there will be less damage to the trees than if the treatment is delayed. In any case, wherever possible it should be done during the summer when the brown withered leaves of infected spurs contrast with the living ones and are a sure guide to places where the knife is required.

That this mode of dealing with the disease in summer is highly effective has been proved experimentally and confirmed by observations made in plantations and orchards in Kent where the method has been adopted.

In 1915 a row of trees (var. Warner's King) in the fruit plantation at Wye College was affected by blossom wilt. From nine of the trees all the withered trusses were pruned off and the spurs cut back until a clean cut was obtained in each case, *i.e.* until all the brown, dead bark and wood had been removed ; as this was done about the middle of June many cankers had to be cut out of the branches during the operation. In the following year five of these trees were quite free from the disease, one had a single dead truss and the other three had two each, *i.e.* an average of less than one dead truss per tree. The rest of the trees in the row (15 in number) had been less thoroughly treated, and in the spring of 1916 the dead spurs which had been allowed to remain bore pustules of the fungus so that all the trees became infected, with an average of eleven* wilted trusses per tree.

It is essential in removing a dead spur that it should be cut back until the living wood and bark be reached ; particularly is this necessary when the work is done early while the fungus is still travelling through the tissues. An instance of imperfect pruning was seen this year in a plantation of young Lord Derby trees ; the dead trusses had been removed soon after wilting but care had not been taken to cut out the whole of the brown, diseased parts. About a fortnight later it was found that in numerous cases a canker had developed round the base of spurs which had not been pruned with sufficient thoroughness. The result was that many of the main branches became girdled by cankers and died.

* This number would have been much higher but for the fact that the trees that year (1916) produced very little blossom, so that there were comparatively few flowers to infect.

If the removal of dead spurs and cankers is left over until winter, either from lack of labour or because the disease was not previously recognised as serious, the affected parts are not so readily distinguished and the cutting away is therefore more difficult to do. Winter pruning can be done any time during the winter or spring before the bloom buds begin to open. In one orchard brought under our notice this year, a number of Lord Derby apple trees were pruned thoroughly to remove all spurs and cankers bearing the fungus ; nevertheless the trees bore a considerable number of wilted trusses for which no source of infection could be detected, and the results appeared unaccountable until it transpired on inquiry that the pruning operations had not been carried out until after the trees had come into bloom, so that many flowers had become infected before the sources of infection had been removed.

The winter treatment even when done carefully usually results in a number of dead spurs and twigs being overlooked, and the trees should be examined early in the following summer for signs of blossom wilt ; if several dead trusses are found near together, further search is sure to discover in their vicinity a spur or canker which had not been cut away. One striking example occurred in a plantation of young Derbys. Most of the trees had been pruned thoroughly and no wilted trusses were found on them, but near the centre of one tree a dead twig with numerous pustules had been overlooked. Within about a foot of this twig there were no less than ten dead trusses of bloom, each of which if left until the following year would have created a fresh source of infection.

Fruit growers in districts where this disease is known to be prevalent are strongly advised, therefore, to examine their apple trees in summer when the blossom wilt condition is most conspicuous, and if possible to cut out then all affected parts ; failing that, the operation may be carried out during the winter or spring, but it must be done before the trees come into flower.

That this recommendation is not impracticable has been proved by certain growers in Kent and Sussex who have carried out the instructions received from Wye College. One grower wrote in 1916 : " To cut off and burn the millions of diseased spurs and shoots on apples and plums is quite impracticable here ;" but this year he says, " I withdraw that statement," since he finds that the task is not an impossible one. Another grower trained women to recognise the disease in winter and to

cut out affected spurs and cankers from large standard trees some 15 ft. high. The results have been excellent, and the loss which threatened to be a most serious one, was almost negligible. The trees were practically free from blossom wilt when examined in June, and the few wilted trusses which were present were easily dealt with.

DESCRIPTION OF FIGURES.

Fig. 1.—Portion of a large canker from a young Lord Derby apple tree showing numerous pustules of the fungus.

„ 2.—A dead spur and canker which has half girdled a branch—winter condition.

„ 3.—Dead cankered twigs bearing pustules.

„ 4.—Branch bearing several infected trusses.

„ 5.—Below is a wilted truss which has been infected by spores falling from the pustules present on the spur above.

„ 6.—Main stem of a young cordon apple tree with upper half killed. Infection occurred at a truss near the middle of the stem.

„ 7.—Below is a canker which has just girdled a branch ; the leaves on the twigs above are beginning to wilt.

„ 8.—The truss on the left was infected by placing spores in a single flower ; result 16 days after the inoculation.

„ 9.—A branch on which four flowers were inoculated with spores ; result about three weeks after inoculation—five trusses are dead.

„ 10.—As in Fig. 9, but nine days later ; a canker has arisen killing the branch.

„ 11.—The same branch as shown in Figs. 9 and 10, showing the condition in the following spring ; pustules of the fungus are present.

REPORT ON AN INFESTATION OF LARVÆ OF THE ANTLER MOTH (*CHARÆAS GRAMINIS*, L.) IN THE PEAK DISTRICT.

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TOWARDS the middle of June in the present year, reports were received that large numbers of caterpillars were present on the hill pastures in the High Peak District of Derbyshire. It was stated that they were principally feeding on the rough grasses, but that in certain districts, they were attacking the better meadow land and an occasional corn crop, and that they had even penetrated into gardens. Information was received from several sources to the effect that they were also invading the valleys, and fear was expressed that they would commit similar depredations among the larger areas of cultivated land there.

On investigation, the caterpillar proved to be that of the Antler Moth (*Charæas graminis*, L.) belonging to the family of the Noctuidæ. It varies from greenish-brown to bronzy-brown in colour with three longitudinal yellowish lines or stripes along each side of the body; a single unpaired stripe also runs down the middle of the back. The whole of the skin is finely wrinkled in a transverse manner, which is a characteristic feature of this particular species. It is devoid of hairs; the under surface of the body is lighter in colour, and the head is dark brown. The first three segments or rings of the body carry a pair of true legs; four pairs of false legs are borne on 6th to 9th segments, and a terminal pair on the last segment.

Life History of the Antler Moth.—When fully grown, the caterpillar measures rather more than an inch and a quarter in length, and large specimens are nearly a quarter of an inch in breadth. At this stage it seeks shelter beneath the surface of the turf, and occasionally under slabs of stone or in crevices of the stone walls that are usually present in the higher hill pastures. It becomes sluggish and, after forming a frail

cocoon, passes into a pupa or chrysalis. In this quiescent stage it is at first orange-brown, but gradually becomes a dark mahogany colour. The time spent in the pupa stage depends upon the prevailing climatic conditions. In the case of the present infestation the writers first met with the pupa on 15th June ; a few more were found on 18th and 25th June. On the latter date most of the larvæ in the Glossop district had passed beneath the surface of the ground preparatory to pupation. The emergence of the adult moth from the pupa commences in July, and the moths may be found on the wing up to September.

The insect measures an inch and a quarter to nearly an inch and a half across the expanded wings, the male being rather smaller than the female. With regard to colour, the fore wings are most commonly of various shades of brown or greyish-brown, with a pale conspicuous branched streak which has been compared with the antlers of a deer, and has given rise to the name by which the moth is commonly called. In some examples, however, the brown is replaced by reddish-brown or olive, there being considerable variability in this respect. The hind wings are grey, becoming darker toward their outer margin.

The moth is frequently seen on moorlands in the daytime, hovering over heather and grass, or at the flowers of ragwort, thistles, etc. As a rule the male is most commonly found in the forenoon, but in the afternoon up to about 5.30 p.m., or later, both sexes are seen. The moth also flies at night, and it has been noticed that the male is often attracted by lights. The insect is widely distributed throughout the British Isles, and is especially abundant in the midlands and north of England, but less plentiful in the more southern counties. In Ireland it is universally common.* Abroad, it occurs in Northern and Central Europe, Northern Asia and North America.† During the month of August on a suitable afternoon the female moth may often be seen dropping the eggs from her body while flying. These fall among the grasses which serve as the food-plants of the future caterpillars.

With regard to the time of hatching of the egg and as to how the insect passes the winter, information is conflicting.

Thus, according to Ritzema Bos, the young caterpillar issues from the egg about three weeks after the latter has been laid, and hibernates

* KANE, W. F. DE VISMES.—*Catalogue of the Lepidoptera of Ireland*, *Entom.*, 1894, p. 264.

† MEYRICK, E.—*Handbook of British Lepidoptera*, London ; 1895, p. 75.

through the winter. Taschenberg also states that the young caterpillar hibernates during the winter. Buckler, on the other hand, states that the egg hatches sometime during the spring, and the insect consequently remains in the egg stage throughout the winter. Meyrick* gives April to June as the months when the larvæ occur. Miss Ormerod† states that the egg soon hatches, and that the caterpillar hibernates during the winter and recommences feeding in spring. She also quotes evidence supplied by several correspondents which support that same conclusion. Reh‡ mentions that the egg hatches in about three weeks and the young caterpillar passes the winter in the earth. Siebke§ remarks "Larva in graminibus, pratos interdum valde vastans, sublapidibus semiadulta hibernat." According to Barratt‖ the winter is passed in the egg state.

Previous Outbreaks.—Sudden outbreaks of the caterpillar have been recorded from time to time in various parts of the country. Thus, Curtis¶ states that in July, 1827, the grass on a large portion of one side of Skiddaw appeared dead, and multitudes of the caterpillars of the Antler Moth were crawling about. The years 1830 to 1836 were remarkable for plagues of these caterpillars in South Scotland. Miss Ormerod** gives a useful summary of numerous infestations, mentioning outbreaks at Clitheroe (Lancs) in 1881; an area of about 10 miles of Glamorganshire, West of the Rhondda Valley in 1884; and over the hill pastures of Ettrick and Yarrow, (Selkirkshire) in 1885. In 1885, there was a wide infestation of the hilly sheep runs in south-west Scotland, embracing many square miles, situated in at least seven counties. It also appeared to a lesser degree over parts of the same area in the following year. In 1898, it was recorded as being present in some numbers in Surrey, though it is doubtful whether any severe infestation has ever been recorded so far south. The latest previous attack in Derbyshire which the writers have been able to trace, occurred in or about the year 1881, but no details relative to the severity of the outbreak are forthcoming. One of the writers investigated a slight outbreak in Glamorganshire in 1910, but the attack was too far advanced for the organisation of any measures of control.

The Present Infestation.—As regards the present outbreak, the earliest report came from Kinver End, where great numbers of the caterpillars were noticed on 26th May. On 11th June,

* Loc. cit., p. 75.
† *Report on injurious Insects for* 1894, pp. 13-14.
‡ *Handbuch der Pflanzen-krankheiten* by P. Sorauer, Vol. III, 1913, p. 369.
§ *Enumeratio Insectorum Norwegicorum: Lepidoptera*, p. 53.
‖ *Lepidoptera of the British Islands*, Vol. IV., 1897, p. 130.
¶ *Farm Insects*, p. 507.
** *Reports on Injurious Insects*, 1884, p. 16; 1894, p. 13; 1895, p. 19.

it was observed on the hills at Castleton and at Whaley Bridge on or about 8th June. It was also very evident on the hills at Chinley, on Rushop Edge near Edale, on all the high moors around Glossop, on Whittle Pike, Rossendale (Lancs), on the moors north of Heywood (Lancs), at Dunford Bridge (Yorks), in certain hilly parts of Cheshire bordering on Derbyshire, and in Westmorland. It is probable, therefore, that the area affected is nearly as extensive as that involved in the great outbreak in south-west Scotland in 1894.

One or both of the writers visited the High Peak district on four occasions between 15th and 30th June, and examined the countryside from Chapel-en-le-Frith along Rushop Edge to Castleton, many of the moorland pastures around Glossop, and between Glossop and Hayfield. They found that the principal grass attacked was that known locally as " bent " grass (*Nardus stricta*), which forms much of the upland pastures at heights of 750 ft. and over. Cotton grass (*Eriophorum*) and other species appeared to suffer less severely. The infestation, furthermore, was noticeably more severe as the altitude increased. In fact, the presence of " bent " grass, and the altitude appeared to be distinct factors in the limitation of the infestation. The writers did not discover the caterpillar in any locality at an elevation less than 900 ft., but from that altitude up to 1,700 ft. it was prevalent. A remarkable feature was that the more succulent and finer grasses escaped; couch grass was unattacked and no damage was observed to bilberry, white bedstraw, heather or bracken, even at the higher elevations. They found no trace of the larvæ having attacked the cultivated or better hill grasses, nor any corn crop, even when the latter were but a few yards away from badly-attacked areas of the coarser hill pastures. In one instance, larvæ were found in a meadow near Glossop. This meadow was a somewhat neglected one, and contained a large proportion of " bent " grass. On examination it was found that the latter alone suffered, all other grasses and vegetation in the same meadow remaining untouched. The damage committed to the upland grass areas was very severe, and bare, brown hillsides were characteristic features in the infested parts of the country. When kept in captivity the caterpillars will feed on various other grasses in the absence of " bent " grass.

Definite statements with regard to the food plants of this caterpillar are very scanty in literature.

We have the well-known assertion of Linnaeus that it will not touch *Alopecurus pratensis* and *Trifolium pratense*. Curtis* states that it feeds on all kinds of tender grass and that it eats away the roots and all shoots. Reuter† gives details as to the occurrence of this species in Finland, and as to its migration, when its ravages were complete in one place, to other grasses or crops; to oats, to a lesser degree to barley and occasionally to rye. According to Service‡ the plants most affected in south Scotland in 1894 were deer's hair (*Scirpus cæspitosus*), *Juncus articulatus* and *squarrosus*, bent grass (*Agrostis vulgaris*), blaw grass (*Molinia cærulea*), wire bent grass (*Nardus stricta*), hair grass (*Aira cæspitosa*), rough-stalked meadow-grass (*Poa trivialis*), Yorkshire fog (*Holcus lanatus*), and cotton grass (*Eriophorum vaginatum*). Almost all other writers simply record that it feeds on "various grasses."

The caterpillars were seen in the greatest abundance in the Glossop district, but from various reports it appears that they occurred in similar profusion in other places. At first sight they did not attract much attention, but a few minutes' observation showed that they were crawling in all directions over the moorland fields. They exhibited no definite migratory instinct. In some cases they appeared to be searching for fresh areas of grass; in others, they were moving through an abundance of suitable grass without stopping to feed thereon. When on slopes, they usually travelled downhill. Comparatively few caterpillars were seen actually feeding, and according to Barratt they "feed at night on the grass leaves, hiding away among the roots by day."

They moved with surprising rapidity, and when present in large numbers, a distinct rustle was faintly audible among the dry herbage of the hillsides. At one spot extending over some 300 yards in the Glossop-Hayfield main road, it was impossible to take a couple of footsteps without crushing one or more of the caterpillars, and vast numbers were killed by the wheels of passing traffic.

Barriers.—The two most efficient barriers were found to be water and stone walls. Roadside runnels and rivulets contained vast numbers of drowned caterpillars which had fallen from herbage and steep banks into the water. Stones and debris in the streams were covered with writhing caterpillars, crawling over one another in their efforts to escape from the uncongenial environment. Roadside horse-troughs also contained many hundreds of drowned individuals.

The stone walls, which form such a characteristic feature

* *Farm Insects*, pp. 506-7.
† Quoted from Miss Ormerod's 1895 Report, p. 22.
‡ *Entomologist*, 1894, p. 280.

in the Peak District landscape, were also a moderately efficient barrier. These are built of stone slabs piled one on top of the other, leaving numerous crevices between. Great numbers of the caterpillars were to be seen on the ground at the bases of these walls. Most of them had fallen down in their efforts to surmount the latter. The caterpillars appeared to have little capacity for climbing the vertical faces of the stones. Furthermore, having attained a crevice in these loosely-built walls, they would crawl through if the opening were large enough freely to admit the light. On the other hand, if the crevices were small and dark, they were seen to turn back, thus exhibiting a marked response to the influence of light. On several occasions numerous caterpillars were noticed on both sides of the wall endeavouring to surmount the latter—evidently at a loss as to which direction to take.

Possible Causes of the Outbreak.—The writers are of opinion that the wide distribution of the caterpillars is due to the extensive areas over which the moths cast their eggs, rather than to any special migratory instinct of their own. It appears that all the natural conditions of the past season have been advantageous to the pest. There is definite evidence from several sources that the plover has been exceptionally scarce this year over the affected areas. Starlings have likewise been less abundant. The exceptionally severe weather has, in all probability, caused a certain reduction of bird life in general. Furthermore, the hills were covered in snow for such an extended period that the young caterpillars were admirably protected from harm; even when the snow had disappeared the ground was so frozen that the reduced flocks of birds could not gain access to them. The absence of intermittent mild spells when birds make considerable inroads on insect life, was characteristic of the past winter.

The burning of the coarser mountain pasture growth, and adjacent heathland, has been largely at a standstill during the past two years, owing to the Defence of the Realm Orders as to the exposure of lights. Rather than run the risk of failing to extinguish the fires at the required time, farmers largely omitted this burning altogether. There seems little doubt that this custom of burning is an important factor in destroying the insect, whether in the egg or caterpillar stage of its life history, the firing usually taking place towards the end of March and the beginning of April. Finally, the long spell of dry weather afforded excellent conditions for the development

and growth of the caterpillar, while the lack of moisture itself hindered the growth of the plant and emphasised the injury.

Preventive and Remedial Measures.—In the writers' opinion preventive or remedial measures only directly concern the upland grass areas. They found no evidence to warrant them in advocating any special measures to protect the good pastures or corn crops, that are thinly distributed over the affected areas. For the remainder of the present season, the only course open to the upland grazier is to remove his stock to other areas, or to utilise a proportion of his better meadow grass. With regard to milking cows, no other course is open. This procedure will entail buying some amount of hay for the winter feeding of stock. If, however, co-operation can be effected through the local Farmers' Associations, farmers with some amount of hay in excess of their own and the Army's needs, should sell to those whose meadows have had to be sacrificed to the exigencies of this present summer. If an arrangement of this nature be carried out there will be little need for farmers to dispose of their animals as has been advocated in one or two cases.

The writers are of the opinion that it might be found advantageous to cut permanent trenches, such as are described below, in a transverse direction across each upland pasture. Or, in the case of large unenclosed areas, a series of trenches. The sides of the trenches being vertical, it would take very little labour to trim these trenches up in any year when a severe infestation was threatened. It is true that where arable land is scarce, ploughs are not plentiful, but they could be borrowed or hired at times when they were in least demand for ordinary work. It may be argued, however, that the cutting of such trenches is scarcely worth while in view of the fact that outbreaks of Antler Moth caterpillars are few and far between. Whether this view be held or not, the writers strongly urge the necessity of a careful study of the correlation of insect outbreaks and weather conditions. After a severe winter, such as the last, it is advisable that due warning should be sent beforehand to farmers with regard to any pests that may reasonably be anticipated.

With regard to the pest at present under consideration, if such a warning were issued in time, it would be found more feasible to cut the trenches which the writers advocate directly the frost disappears, and before the caterpillars commence

active depredation, rather than cut permanent trenches years beforehand. Such trenches were found to be one of the most effective methods of control in the case of the infestation of an allied Noctuid caterpillar known as the Army Worm [*Cirphus* (*Leucania*) *unipuncta*, Haw.], in the Dominion of Canada in 1914.* The trenches were cut by ploughing and were then dug out to a depth of 14 in.; the side of the trench away from the advancing caterpillars being trimmed vertical. Every 15 ft. along the trench post holes were dug 1 to 2 ft. in depth. When the caterpillars fell into the trench and were blocked by the vertical side, they changed their course until they reached a post hole. They fell into these post holes in large numbers, and were crushed at frequent intervals by men provided with blunt posts for the purpose.

In the case of the Antler Moth caterpillar, whose migratory instinct is less defined, it is recommended that both sides of the trench be trimmed so as to be quite vertical. By this means they will be effective in trapping caterpillars moving in two directions. Each trench need be no wider than is necessary to admit of its being dug out to the required depth, and a single trench to about every 15 acres of grass land should prove sufficient. If, however, it be deemed desirable during an infestation to protect any area towards which the caterpillars appear to be travelling, the side of the trench away from the advancing caterpillars only need be trimmed vertical, and a small amount of labour is thus saved.

As an alternative measure, poisoned bran has been used with success in Canada against the Army Worm. This bait was used in the form of a mash which was made up as follows :—

A. Three oranges or lemons were squeezed into 3½ gal. of water and their remains cut up finely and added thereto. In this was dissolved 2 qt. of molasses.

B. 20 lb. of bran were mixed dry with 1 lb. of Paris green.

A and B were then thoroughly stirred together in a tub, or other convenient receptacle, until a uniform damp mash was obtained. In Canada this mixture was scattered broadcast among the crops at the rate of about 6 lb. to the acre. In the case of the Antler Moth this method is scarcely feasible. The writers would suggest, however, that trials be made scattering the mash over a belt about 10 yd. wide between an affected area and the grass or crop it is desired to protect.

* A. Gibson. *The Army Worm*. Bull. 9. Dept. Agric. Entom. Br., Ottawa, 1915.

The third method advocated in Canada was spraying with Paris green or arsenate of lead over a belt 20 yd. wide, comprising some kind of dense herbage, ahead of the advancing hordes of the Army Worm. It was found useless to spray herbage which was insufficiently thick to hold the poisoned wash. In using this remedy 1 lb. of arsenate of lead paste should be dissolved in 25 to 30 gal. of soft water. The writers however feel that this measure may not prove successful in this country. The object of the spray is to poison the food plants of the caterpillars, and the " bent " grass, which seems to be the commonest food plant of the Antler Moth, is not adapted to retain any considerable quantities of the wash.

The writers further advocate that the question of approaching the authorities for relaxation of the Order dealing with the exposure of naked lights should be fully considered. As the danger from hostile airships decreases, there seems little reason why these regulations should not be relaxed over the upland areas in question during the burning season.

Greater discrimination should be exercised in the preservation of bird life in these parts. As regards the control of this caterpillar, the value that accrues from the presence of rooks and starlings cannot be overestimated. The writers themselves have noted large flocks of these birds over heavily infested areas. The scarcity of the lapwing is a further factor in connection with the present infestation.

Finally, the writers would point out that the maxim " Prevention is better than cure " applies to the control of the Antler Moth as much as it does to that of many other insect pests, and would therefore urge the desirability of a careful study of the correlation between insect outbreaks and weather conditions throughout the country, and the establishment of a system by which farmers could be regularly warned in advance of the pests to be expected in any season.

AN INVASION OF THE CATERPILLARS OF THE ANTLER MOTH INTO YORKSHIRE.

JOHN SNELL

(*Intelligence Division, Board of Agriculture and Fisheries*).

A REPORT that there was a serious attack of caterpillars on the pasture land at Airton, Malhamdale, Yorkshire, was received by the Board on 13th June, and the district was visited on the 15th in order to ascertain to what extent the pest was prevalent and what damage was being done. Subsequently reports were received from Howes Junction, Bowfell, Garsdale, Tebay Fell, Slaidburn, Kirkby Stephen and Sedbergh, and it has since been reported from Threlkeld. It therefore seems probable that the caterpillars were present on practically all the mountain pasture lands from Derbyshire to Westmorland.

Extent and Intensity of Attack.—The damage done by the pest appears to have been confined entirely to the mountain pasture lands, and in no instance does it appear to have reached the meadow lands or the mowing grass. Early in May one or two farmers in the Airton district had noticed that some of their pasture still maintained a "brown, winter appearance" and that the sheep were being "starved," but it was only about the 1st June that they actually observed the presence of the caterpillars. The pastures which were first attacked were those near the tops of the Fell. On one farm alone on Scotsthrop Moor over 100 acres of mountain pasture was damaged to such an extent that practically no stock will be able to be carried for the rest of the summer. In this district there is practically no arable land, but the farmers were greatly alarmed lest the plague should spread to the better pastures and the meadow land in the valleys and on the lower slopes of the hills. The caterpillars were most abundant by the walls and along the small watercourses which intersect the pastures. At first, it was thought that this was due to the fact that in these situations there was probably a larger proportion of the harder and smoother grasses, but subsequent investigations indicated that the walls and the small streams acted as barriers to their progress. In the small stone folds thousands of caterpillars were trapped. The accompanying illustration shows the caterpillars accumulated in the corner of a field. Although there were many large holes in the wall

they did not appear to pass through. Many of them can be seen endeavouring to climb up the walls, but it is very doubtful whether they actually passed into the dark crevices ; in fact, the darkness seemed to stay their progress, caterpillars at the entrance to a hole being observed to hold their heads erect in order to find some means of avoiding it. Further evidence that the walls acted as a barrier was obtained by observations on two adjoining pastures below High Side. The pastures were separated by a wall with a gateway at one end, and though the one pasture was attacked early in the spring the adjoining pasture never showed any sign of attack except for a small patch round the gateway.

When the district was visited on the 15th June, which was a bright, sunny day, a large proportion of the caterpillars appeared to be migrating rather than feeding. The extent to which they were present was indicated by the large numbers which were trapped in holes and cavities due to drains having fallen in. In a single hole there must have been many thousands of larvæ. In the pools of one small stream there were larvæ lying in masses from 6 to 9 in. deep. These were decaying and the stench was very noticeable. In fact, all the small streams intersecting the invaded pastures were covered with a green slime due to the decay of large numbers of caterpillars which had been drowned. Mr. Cousins, who visited the Howes district, states that the caterpillars found their way into the wool of the sheep when they were lying down, and that consequently the sheep became very restless. The owner of the sheep stated that it had been necessary to move them to other pastures, but it seems probable that the sheep were restless owing to the lack of grass.

It was evident that the caterpillars were migrating down from the mountain pastures to the lower grass lands. The pest appears to move very rapidly, and it was noticed that on an average a caterpillar could travel at the rate of from 18 in. to 2 ft. per minute, which would mean that quite a long distance would be traversed in 24 hours. On Scotsthrop Moor they never reached the good pastures, but at Winterburn they came down lower. As stated above, the walls acted as barriers and thousands were trapped in the streams, rabbit holes and fallen drains, so that the damage done was much less on the lower slopes than on the tops of the fells. In no instance, however, did they reach the mowing grass or even the best lands.



FIG. 1.—Showing Caterpillars of the Antler Moth at the base of a stone wall.

Food Plants of the Caterpillar.—Careful observations were made as to the food plants of the caterpillars. Scotsthrop Moor was visited with Mr. Stapledon, who identified the grasses on which larvæ were actually observed to be feeding. These grasses were as follows :—

Tussock Grass (*Aira Cæspitosa*).—The young shoots of this grass must have been eaten early in the season, for in the pastures first attacked there were only the brown dead leaves of last year's growth.

Mat-grass (*Nardus stricta*).—Only one or two caterpillars were seen feeding on this species, but in those pastures where the pest was first observed only the brown dead leaves of last year's growth were present, and it was evident that the young shoots must have been eaten early in the season. In fact, the brown appearance of the attacked pastures was due to the fact that only the dead leaves of the mat-grass and the tussock grass were present. It might, perhaps, even be suggested that the moth lays its eggs in these grasses, which are the most prevalent grasses in the pastures attacked.

Sweet Vernal (*Anthoxanthum Odoratum*).

Sheep's Fescue (*Festuca ovina*).

Fiorin (*Agrostis alba*).

In addition to the grasses the caterpillars were also found to be feeding on the

Heath Rush (*Juncus squarrosus*),
Wood Rush (*Luzula*, sp. ?), and
Carex (sp. ?).

On Scotsthrop Moor, although a careful search was made, no caterpillars were observed to be feeding on any of the clovers or trefoils, but Mr. Cousins observed two of the caterpillars feeding on clover at Mallerstang.

Methods of Preventing Migration.—From the large numbers of larvæ trapped in pits and watercourses it was evident that a trench would prevent their advance. This was suggested to some of the farmers, and it was further suggested that the spraying of a belt with lead arsenate would act as a barrier. I am inclined to think that in those pastures surrounded by walls a trench or a sprayed belt would only be necessary at the gateways or wherever there were breaks in the walls. Mr. A. O. Blackhurst, of Southport, the chemist of the Sulphate of Ammonia Committee, visited the district with me in order to test the efficacy of some of the coal-tar waste products. We used some of the heavy, medium and light oils, and also an arsenical waste product obtained in the manufacture of sulphate of ammonia. All these substances certainly acted as contact insecticides. Wash oil killed the caterpillars in a few seconds, but the difficulty found in using this was that for

some reason the anthracine present in it crystallized out and choked the nozzles of the machine. It was found that a large proportion of water could be added to this fluid to form an emulsion, when it still acted as a powerful insecticide. To test whether such oils would act as a barrier, a belt about 2 ft. wide was spread around the small portion of an infected pasture. It was thought that any caterpillars crossing this belt would become smeared with the fluid and be subsequently scorched. It was doubtful as to what length of time the fluid on the grass would remain effective. A visit was paid about a fortnight after the spraying had been done, and it was found that the attack in this pasture had not spread beyond the sprayed belt, although a few caterpillars were still feeding inside the belt.

No definite deductions can be made from this preliminary experiment, but it seems possible that some of these oils might be useful to prevent the spread of such caterpillar attacks. The farmers in the districts concerned were informed that if they found the pest spreading to the lower pastures a supply of machines and lead arsenate would at once be forwarded upon receipt of a wire, but no call has been made, and it must therefore be presumed that the pest confined its attention to the mountain pastures only.

A NEW SOURCE OF POTASH.*

Harold T. Cranfield,

Agricultural Chemist to the Midland Agricultural and Dairy College.

Among the many difficulties with which agriculture has had to contend since the opening of hostilities in August, 1914, undoubtedly one of the greatest has been the lack of potash fertilisers. The Stassfurt deposits of Germany have, in past years, almost exclusively supplied the world's demand for this substance, and the sudden cutting off of the German exports of potash salts has been a serious hindrance to the efforts of farmers in maintaining our food supplies.

The German potash salts were first utilised for agriculture about the year 1880, and the consumption in the United Kingdom had increased from 4,000 tons of potash (K_2O) in 1895 to 22,000 tons in 1913. In consequence of the almost unlimited supplies of German potash, and their comparatively cheap price, English chemists have not troubled in the past to investigate possible sources of potash at home, and the advent of war has exposed their neglect in this direction.

* See also p. 582.

Many suggestions have been made during the past three years with the object of partially making up this deficiency of potash; such are the use of seaweed, the systematic burning of hedge brushings, the application of lime and salt, etc.; but none of these can possibly supply a tithe of the potash needed to keep our home-grown food supply up to the highest possible pitch.

For several years it has been known to chemists that flue-dust and gases driven off from iron blast furnaces contained an appreciable percentage of potash, but only recently has the suggestion been made that these by-products might be of value for agricultural purposes. During the past few months the writer has been in touch with the owner of several blast furnaces in the Midlands, and has been convinced by a preliminary investigation that there is in these flue-dusts a very large source of potash, which, if properly investigated and controlled, may satisfy in the future at least half, and possibly three-quarters, of our agricultural needs.

Origin of the Potash.—Up to the present practically no research has been carried out with regard to the origin of this potash, the only paper at present published (as far as the writer is aware) being one read, in February of this year, before the American Institute of Mining Engineers, by Mr. R. J. Wysor, Superintendent of the Bethlehem Steel Company's blast furnaces in Pennsylvania, U.S.A. In this paper Wysor goes into the question of the quantity of potash recovered in the flue-dust and wash-water, and the loss of potash in the gases passing up the chimney stacks. He also deals with devices for cleaning the gases and so recovering much of the lost potash.

Blast furnaces are fed with ironstone, coal, coke and limestone. The ironstone contains a small percentage of potash, presumably in the form of silicates. Three samples of Northamptonshire stone analysed gave an average of 0.2 per cent. potash (K_2O). Undoubtedly potash is also present in the fuel, but few analyses appear to have been published giving the potash content of coal and coke. One or two which have been placed at the writer's disposal give figures ranging from 0·15 to 0·4 per cent. potash.

The enormous heat at the base of the furnace, assisted by the action of the lime and fuel, appears to break down the potassium silicates, potassium oxide (K_2O) in the gaseous state being formed. This in turn reacts with sulphates and chlorides present producing potassium sulphate and potassium chloride.

These potash salts condense in the cooler regions and pass up the furnace in the form of a fine dust. Owing to there not being sufficient air for complete combustion the particles become coated with carbon, and, together with a large quantity of particles of fuel, ironstone, etc., pass over with the gases into the "down-comer," or main down-flue. At the bottom of this flue is a cavity which retains the greater bulk of the dust (about 75 to 85 per cent.) in the form of a coarse, black powder. The finer particles, which contain the greater proportion of the potash salts, are carried on into the ovens or round boilers of the Lancashire type, where the gases, being combustible, are burnt, the heat produced being utilised in the production of steam for power purposes. The dust deposited in the ovens or round boilers is brick red in colour and somewhat finer than the black dust. The burnt gases issuing from the ovens carry with them the finest of the dust particles, and a further portion of these collects in the various flues, the gases and probably the finest particles of dust ultimately escaping by the stack. Many of the later-deposited flue-dusts are cream in colour and very bulky. They constitute the richest source of potash.

Composition of the Flue Dusts.—These potash-bearing flue dusts vary enormously in colour and composition—in fact the writer has not yet found two samples alike.

The black dusts contain, as one would suppose, considerable amounts of insoluble ferrous compounds. Insoluble sulphides are also present. Occasionally one meets with black dusts which contain soluble cyanides, sulphites, and even free alkali; these should be avoided for agricultural purposes.

The red dusts are rich in ferric oxide, while many of the cream dusts contain either free lime or calcium carbonate. All are rich in silica and silicates.

The potash exists mainly as potassium sulphate with a smaller proportion of chloride, the remainder being in an insoluble form. The availability of the latter is a subject for urgent investigation. The amount of soluble potash varies very much; in samples which the writer has examined the variation was between 50 and 70 per cent. of the total potash. After extracting the flue dust with hot water evaporation of the extract yields a white residue which contains on an average 70 to 80 per cent. potassium sulphate and chloride. Sodium chloride and calcium sulphate constitute the chief impurities in this water-soluble extract.

The following analyses of flue dusts will give some idea of the potash content of typical samples :—

Laboratory Number.	Colour.	Water-soluble Potash, per cent.	Total (acid-soluble) Potash per cent.
1493	Cream.	9·25	15·89
1502	Black.	—	3·13
1503	Red.	5·92	8·50
1504	Black.	1·68	2·97
1504B	Black (burnt).	—	5·12
1573	Black.	2·01	3·73
1590	Black.	1·23	3·13
1537	Cream.	5·69	11·82
1538	Red.	4·68	7·58
1539	Grey.	5·88	12·46
1566	Light brown.	3·82	7·51
1567	Grey.	4·70	7·10

Potash content of the salt obtained by extracting the flue dust with hot water.

Laboratory Number.	*Potash* (K_2O) *content per cent.*
1510	40·04
1523	41·27
1589	41·84
1632	39·74

Quantity Available.—It is difficult at present to give more than a rough approximation of the total amount of potash which could be obtained from this source, but the writer offers tentatively the following figures, which he is at present inclined to believe rather under- than over-estimate the quantity available :—

Number of furnaces in full blast in Great Britain 300

Quantity (in tons) of flue dust produced per furnace per week :—

Black	20
Red	5
Cream	1

Assuming the Black to contain 2·5 per cent. potash,

" Red " 7 " "

" Cream " 10 " "

0·95 tons of potash per furnace per week would be produced. Each furnace would, therefore, yield about 50 tons of potash per annum, this giving for the 300 furnaces a total annual production of 15,000 tons. Of course this represents total potash of which all may not be available, but at least 50 per cent. of this would represent soluble potash.

The writer therefore considers this to be the most important source of potash yet discovered in this country. It is obvious that only a careful and thorough investigation into the whole question can result in the full benefit of these deposits being obtained for agriculture, but until arrangements can be made and plant erected for the extraction of the water-soluble potash salts, the raw flue dust might be utilised on land which must have become very deficient in potash during the past two years.

The writer wishes to express his best thanks to Mr. E. P. Davis of the Bennerley Furnaces, Ilkeston, for placing full facilities at his disposal, and to Messrs. Simpson and Rice for their valuable assistance, without which he would have been unable to obtain much of the information contained in this paper.

THE VALUE OF CIDER APPLES AND POMACE AS FOOD FOR FARM STOCK.

Professor B. T. B. BARKER, M.A., and B. N. WALE, B.Sc.

University of Bristol.

IN view of the present necessity for utilising every possible source of stock food, an experiment was arranged at the Seale-Hayne College, Newton Abbot, in conjunction with the Agricultural and Horticultural Research Station, Long Ashton, to determine the feeding value, if any, of cider apples and freshly-pressed pomace. It is estimated that on an average not less than 60,000 to 70,000 tons of pomace are produced annually in this country, and in the West of England pomace is fairly generally used for the feeding of stock on farms where cider is made. There is, however, a complete absence of any data on feeding trials from which its nutritive value could be deduced, and the only definite information bearing on the point is that furnished by analyses of this product. The composition of pomace has been dealt with recently in this *Journal**; it was shown that freshly-pressed pomace is of distinctly higher feeding value than mangolds, and richer in carbohydrates though lower in protein than wet brewers' grains. The paper referred to emphasises the necessity of feeding it whilst it is still fresh and sweet, unless steps are taken to preserve it from decomposition; methods of preservation are described.

* See *Journal*, Vol. XXII, p. 851.

Even less is known with regard to the food value of cider apples. Before the War their use for stock feeding was not seriously considered, and was doubtless limited to the comparatively rare occasions when, owing to a glut of fruit, shortage of labour, or some other special reason, the crop was not gathered for cider-making. In such cases stock have been turned into the orchards to feed on the fallen fruit which they consumed with more or less relish and without harm provided that they did not over-feed.

During the cider-making season of 1916, since it was only practicable to conduct feeding trials on a limited scale, it was decided to confine them to pigs. The experiment was planned to determine the effect of substituting apples or pomace for a portion of the daily ration, and to obtain a qualitative rather than quantitative measure of their food value. In October, 1916, 20 pigs (Large Blacks and cross breds), varying in weight from 40 to 69 lb., were selected and distributed as equally as possible amongst 5 pens. Their rations throughout the experiment are given in Table I.

TABLE I.—*Daily Rations in lb. per Pen of 4 Pigs.*

Food.	Pen 1.				Pen 2.				Pen 3.				Pen 4.				Pen 5.			
	Oct. 18.	Nov. 15.	Dec. 13.	Jan. 10.	Oct. 18.	Nov. 15.	Dec. 13.	Jan. 10.	Oct. 18.	Nov. 15.	Dec. 13.	Jan. 10.	Oct. 18.	Nov. 15.	Dec. 13.	Jan. 10.	Oct. 18.	Nov. 15.	Dec. 13.	Jan. 10.
Apples	10½	20	21	—	5¼	10	10½	—	—	—	—	—	—	—	—	—	—	—	—	—
Pomace	—	—	—	10	—	—	—	7½	—	—	—	—	8	4	3¾	5	4	6	8¼	5
Sharps	6½	10¼	8	14	7¾	12	9¾	15	8¼	13½	11¼	18	6½	12½	10	16	7¾	11½	8	16
Maize meal ..	3¼	3¼	9¾	9¾	3¼	3¼	9¾	9¾	3¼	3¼	9¾	9¾	3¼	3¼	9¾	9¾	3¼	3¼	9¾	9¾
Fish meal	—	1½	2½	—	—	1½	2½	—	—	1½	2½	—	—	1½	2½	—	—	1½	2½	—

Cider apples were introduced at the rate of 5¼ lb. per pen per day to Pen 1 and half that quantity to Pen 2. No difficulty arose in connection with the pigs eating the apples, and the quantity given was gradually increased to 10½ lb. and 21 lb., respectively, per pen per day by 1st December. To prevent choking, the apples were passed through a turnip cutter and mixed in with the meal and water from 14 to 20 hours before feeding ; they never formed more than one-third to one-half by weight of the total food. The cider apples were home grown and valued at 30*s.* per ton.

Pomace was obtained at first direct from the National Fruit and Cider Institute and later from a local cider merchant, and was fed at the rate of 4 lb. per day to Pen 5 and 8 lb. daily to

Pen 4. For some unknown reason Pen 4 took the pomace with much greater difficulty than Pen 5, and the daily ration had to be reduced as low as 1 lb. by 16th November, and then gradually increased up to a maximum of 5 lb. per pen daily. On the other hand, Pen 5, commencing with 4 lb. daily, gradually increased its consumption to 10 lb. This was reduced on 10th January, to 5 lb. daily, because the pomace for the latter stages of the experiment was not quite fresh; it had been put down in tubs in November at the time the local cider press ceased working for the season, and although it had been well consolidated when placed in the tubs, a certain amount of decomposition had set in and had made it less palatable to the pigs. The proportion of pomace in the ration varied from one-tenth to one-third of the total weight of food.

It is rather difficult to assess a satisfactory value for the pomace. In the present experiment the fresh pomace has been valued at 5*s*. per ton, which merely represents the cost of carriage. On most west-country farms the cost of the material to the farmer is nil, since it is obtained as a waste product in the course of cider-making. In fact, where it has not been used for stock feeding it has been regarded rather as a nuisance; but recently, owing to the introduction of drying plant for dealing with it on a large scale, pomace has been recognised as a useful ingredient in compound cattle foods, and its market value is likely to increase before long.

Sharps or middlings were fed to each lot of pigs over the whole period, the quantity varying according to the amount of apples and pomace fed and increasing as the pigs got heavier. Substitution was made at the rate of about 5 lb. apples or $2\frac{1}{2}$ lb. pomace for 1 lb. of sharps. The sharps cost £11 17*s*. 1*d*. per ton.

Maize meal was gradually increased from $3\frac{1}{4}$ to $9\frac{3}{4}$ lb. per pen per day, and was obtained in two consignments costing £13 4*s*. 4*d*. and £16 12*s*. per ton respectively.

Fish meal was fed about a fortnight after the experiment commenced at the rate of $\frac{1}{2}$ lb. per pen daily. This was increased to a maximum of $2\frac{1}{2}$ lb. daily per pen by 1st December, and was continued until 16th December, after which it was discontinued altogether, so that there should be a period of at least one month's feeding without fish meal before the pigs were slaughtered. The fish meal formed on the average about one-ninth of the total meals fed, and cost £11 15*s*. per ton.

All the foods used in the experiment were analysed and their composition is set out in Table II.

TABLE II.—*Composition of Foods Used.*

—	Apples.		Pomace.		Sharps.	Maize Meal.	Fish Meal.
	1	2	1 Long Ashton.	2 Newton Abbot.			
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Water	83·8	83·0	67·20	71·75	15·70	14·20	14·9
Protein	·7	·5	1·90	1·70	15·33	9·53	49·1
Fat	·4	·3	1·47	1·05	4·86	4·08	8·6
Crude fibre	1·2	2·6	13·70	12·22	21·80	2·20	4·3
Carbohydrates ..	13·3	13·2	15·17	11·78	38·72	68·66	3·5
Ash	·6	·4	·56	1·50	3·59	1·33	19·6

The composition of the apples and pomace was naturally subject to considerable variation, according to the source of supplies and to the condition of the material. The two samples of pomace were taken from the material actually used in the experiment ; but, owing to the difficulty of obtaining representative samples of the sliced apples, the figures given for the apples are not the result of direct analysis. The first set of figures is based on an analysis of apples by Henry, and the second gives calculated values for the apples which furnished the pomace sample No. 1.

The experiment may be divided into two periods—

I. From 5th October to 15th December, during which both apples and pomace were used.
II. From 16th December to 15th January, during which only pomace was used.

At the end of Period II. the pigs were slaughtered and their carcass weights were determined. In order to obtain comparative carcass weights for the end of Period I., it was estimated that the carcass weight on 15th December was 2 per cent. lower in every case than it was on 15th January, as follows :—

	Percentage of Carcass to Live Weight at end of Period II.		*Calculated Percentage of Carcass to Live Weight at end of Period I.*
Pen 1	72·93	− 2 =	70·93
,, 2	73·17	− 2 =	71·17
,, 3	73·77	− 2 =	71·77
,, 4	74·44	− 2 =	72·44
,, 5	74·24	− 2 =	72·44

In Table III. are set out the experimental results for Period I.

TABLE III.—*Experimental Results for Period I.*

—	Fasted Live Weight.		Gain in Live Weight in 71 Days.	Calculated Carcass Weight.	Food Consumed.						Total Meal Consumed per lb. Live-Weight Increase.
	At Start.	At end of Period I.			Apples.	Pomace.	Sharps.	Maize Meal.	Fish Meal.	Total Meals.	
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Pen 1 i.	63	139	76								
ii.	44	87	43								
iii.	56	146	90								
iv.	51	142	91								
Total	214	514	300	364·59	1,142	—	547	390	91	1,028	—
Pen 2 i.	60	134	74								
ii.	46	121	75								
iii.	56	147	91								
iv.	51	125	74								
Total	213	527	314	375·06	570	—	669	390	91	1,150	3·66
Pen 3 i.	56	132	76								
ii.	60	156	96								
iii.	52	152	100								
iv.	43	115	72								
Total	211	555	344	398·32	—	—	771	390	91	1,252	3·64
Pen 4 i.	54	118	64								
ii.	64	155	91								
iii.	54	137	83								
iv.	40	104	64								
Total	212	514	302	372·34	73	251	652	390	91	1,133	3·75
Pen 5 i.	44	88	44								
ii.	69	158	89								
iii.	51	130	79								
iv.	49	144	95								
Total	213	520	307	376·68	35	355	614	390	91	1,095	

From a consideration of the live-weight gains it will be seen that Pens 1 and 5 each contained a pig which did less well than any other pigs in the experiment, their gains being 43 and 44 lb., respectively, while other pigs of similar size made gains of about 70 lb. Obviously, therefore, these pigs did badly owing to individual defects. There is no doubt they ate less food than the other pigs of their respective pens; consequently the remaining three pigs of these pens had a larger available food supply than the corresponding pigs in the other three pens. On this account it is perhaps advisable to cut out entirely the results obtained from Pens 1 and 5 and consider only those from Pens 2, 3, and 4.

Table IV. gives the financial results of Period I. assuming that the pigs were worth 18*s.* per score at the end of that period, and calculating their carcass weights as shown above. Nothing is charged on the one hand for labour and straw for bedding, nor on the other hand has anything been allowed for the value of dung produced. These two items are generally taken to balance one another.

Pen 3, the "meal only" pen, made the most profitable increase and further, the effect of substituting apples or pomace for part of the meal was to reduce the gain from the meal consumed. It should not be overlooked, however, that the substitution of apples and pomace for meal materially altered the nutritive balance of the ration, resulting more particularly in a considerable decrease of protein and fat. Moreover,

TABLE IV.—*Financial Returns for Period I.*

—	Market Value of Pigs at Start.	Cost of Food.						Cost of Pigs plus Cost of Food.	Value of Pigs at 18*s.* per score.	Balance per Pen.
		Apples.	Pomace.	Sharps.	Maize.	Fish Meal.	Total.			
	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*	£ *s.* *d.*
Pen 2 i.	1 18 8									
ii.	2 3 0									
iii.	1 16 0									
iv.	1 16 0									
Total	7 13 8	0 7 7	—	3 11 11	2 4 4	0 9 7	6 13 5	14 7 1	16 17 6	2 10 5
Pen 3 i.	1 18 8									
ii.	2 3 0									
iii.	1 16 0									
iv.	1 16 0									
Total	7 13 8	—	—	4 1 10	2 4 4	0 9 7	6 15 9	14 9 5	17 18 6	3 9 1
Pen 4 i.	1 18 8									
ii.	2 3 0									
iii.	1 16 0									
iv.	1 16 0									
Total	7 13 8	0 1 0	0 0 7	3 9 0	2 4 4	0 9 7	6 4 6	13 18 1	16 15 1	2 16 11

Pen 3 made exceptionally good gains, and had it required, say, 4 lb. of meal instead of about $3\frac{1}{2}$ lb. to produce 1 lb. live-weight increase, then the apples and pomace would have made a far better showing.

As the apples were nearly finished and no further supply was available for Pen 2 after 15th December, they were first reduced and then entirely replaced by pomace on 18th December. In Tables V. and VI. are given the experimental results for Period II., and the financial returns for that part of the experiment. The pigs were bought by the Totnes Bacon Factory, and the average price per score on the whole of the pigs sold was 19*s.* $2\frac{1}{4}$*d.* It will be seen that the differences in the cash returns between the three pens were not very appreciable and, further, that the pomace-fed pigs gave a very satisfactory live-weight increase in Pen 4, *i.e.* 159 lb. against 158 lb. for the "all-meal" pigs in Pen 3. Also in Pen 2, which only made an increase of 144 lb. live weight, the cost of the food was about 9*s.* less than in Pen 3.

TABLE V.—*Experimental Results of Period II.*

——	Fasted Live Weight.		Gain in Live Weight in 30½ Days.	Actual Carcass Weight.	Food Consumed.			
	At Start.	At end of Period II.			Apples.	Pomace.	Sharps.	Maize Meal.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Pen 2 i.	134	173	39	121				
ii.	121	152	31	111				
iii.	147	179	32	139				
iv.	125	167	42	120				
Total	527	671	144	491	9	220	425	302
Pen 3 i.	132	174	42	121				
ii.	156	192	36	147				
iii.	152	193	41	142				
iv.	115	154	39	116				
Total	555	713	158	526	—	—	515	302
Pen 4 i.	118	157	39	115				
ii.	155	191	36	147				
iii.	137	183	46	136				
iv.	104	142	38	103				
Total	514	673	159	501	—	151	454	302

It would seem, therefore, that in the later stages of fattening, when a pig has reached 5 scores, pomace is a useful article of diet used at the rate of 2 to 3 lb. per head daily, and, provided the pomace has been carefully consolidated when taken from the press, it can be used satisfactorily even if 1½ to 2 months old.

In supplementary trials which it is hoped to carry out in succeeding seasons, an attempt will be made to ascertain more nearly whether it is more profitable to use the apples themselves or the pressed pomace obtained from them after cider-making. So far as the present trial goes, it seems that the fruit could be utilised to best advantage by first pressing it for cider-making and then using the pomace as stock food.

Finally, it may be pointed out that although the experiment as arranged afforded a means of comparing these materials with sharps for feeding purposes, it is not suggested that they should

TABLE VI.—*Financial Returns for Period II.*

——	Value of Pigs at Start.	Cost of Food.					Cost of Pigs plus Cost of Food.	Value of Pigs at 19s. 2½d. per score.	Balance per Pen.	
		Apples.	Pomace.	Sharps.	Maize.	Fish Meal.	Total.			
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Pen 2 ..	16 17 6	0 0 2	0 0 6	2 4 11	2 4 9	—	4 10 4	21 7 10	23 11 4	2 3 6
Pen 3 ..	17 18 6	—	—	2 14 6	2 4 9	—	4 19 3	22 17 9	25 4 11	2 7 2
Pen 4 ..	16 15 1	—	0 0 4	2 8 1	2 4 9	—	4 13 2	21 8 3	24 0 11	2 12 8

be regarded in any sense as complete alternatives for the latter. The protein and fat contents of the latter so far exceed those of the former that a fair comparison could not be made without the addition of protein and fat to the fruit ration.

Conclusions.—One is not justified as the result of a single experiment in drawing definite conclusions. Further tests are necessary, but the above results appear to indicate that, while for fattening pigs weighing not more than 55 to 60 lb. per head neither cider apples nor pomace give as satisfactory results as meal alone, both these foods possess a distinct feeding value for older pigs and store pigs.

PROCEEDINGS IN 1916 UNDER THE TITHE, COPYHOLD, COMMONS, AND OTHER ACTS.*

Tithe Acts, 1836 to 1891.—The value of £100 tithe rent-charge for the year 1917 is £92 1*s.* 0¼*d.*, whereas its value for the year 1916 was £83 2*s.* 6¾*d.*

Tithe rent-charges amounting to £1,272 in respect of a total area of 4,523 acres were extinguished by declarations of merger. Tithe rent-charges and extraordinary tithe amounting in all to £1,160, in respect of a total area of 8,791 acres, were extinguished by redemption.

The following table gives particulars of redemptions of tithe payments, and mergers of tithe rent-charge :—

Nature of Tithe Payment.	Applications Received.	Cases Completed.		Cases in Progress on 31st Dec., 1916.
		No.	Amount of Annual Charge.	
			£	
Tithe Rent-charge	181	257	1,158	299
Corn Rents payable under Local Inclosure Acts ..	6	10	80	5
Extraordinary Tithe ..	5	4	2	1
London (City) Tithe Rate ..	7	5	52	6
Vicar's Rate in Halifax ..	3	3	8	—
Mergers of Tithe Rent-charge	67	62	1,272	21

* As a measure of war economy, this Annual Report is not being issued separately in its usual form. For the 1915 Report, see this *Journal*, Vol. XXIII., p. 123 ; for the 1914 Report, see Cd. 7916.

Altered apportionments of tithe rent-charge and other tithe payments were as follows :—

Nature of Tithe Payment.	Applications Received.	Cases Completed.	Cases in Progress on 31st Dec., 1916.
Tithe Rent-charge	138	212	200
Corn Rents payable under Local Inclosure Acts	—	2	3
Extraordinary Tithe	5	6	17

Three applications were received for the Board's sanction of the exchange of glebe for other land. Four exchanges were completed, and one was in progress on 31st December. One exoneration of land from extraordinary tithe was received and completed in the year.

Fees amounting to £2,797 were received in respect of business under the Tithe Acts.

Copyhold Act, 1894.—The Board received 103 applications for enfranchisement, and completed 107 cases, of which 28 were voluntary and 79 were compulsory, while 38 cases remained in progress at the end of the year. The total consideration for the completed enfranchisements comprised capital payments amounting to £6,201, and annual rent-charges amounting to £84 13*s.* 4*d.*

Two enfranchisement rent-charges, amounting in all to £68 15*s.* 6*d.*, were redeemed.

Fees amounting to £318 10*s.* were received in respect of business under the Copyhold Act.

Conveyancing and Law of Property Act, 1881.—Two redemptions of rent-charge under Section 45 were completed in the year 1916. A total of 62 redemptions in all have now been effected under this section.

Commons Act, 1899.—A scheme was approved by the Board for the regulation of Ewhurst Green (about 11 acres in area) in the county of Surrey.

Commonable Rights Compensation Act, 1882.—In respect of a sum of £620 paid by the Lancashire Territorial Association as compensation for the extinguishment of common rights over a portion of Holcombe Moor, Lancashire, the Board made an Order directing trustees to apply the money to the improvement of the herbage and the repair of the roads and fences.

Inspection of Maps and Documents.—The reduced fee of 1*s.* which had for several years been charged to the public for the

inspection of certain public documents deposited with the Board at 3, St. James's Square, was, as a war measure, restored to its original amount, viz., 2*s.* 6*d.*, as from the 1st January; and the hours during which inspections can be made were restricted to the mornings of each week-day in consequence of the depletion of the Board's staff. An average increase of 50 per cent. on the charges for the supply of copies and extracts from these documents and tracings of any maps relating thereto came into operation in June.

THE CANNING OF FRUIT AND VEGETABLES.*

The importance of preserving the largest possible quantity of vegetable food for winter use is recognised by everybody. In the case of fruit the importance is all the greater, insomuch as there is reason to expect that the amount of jam produced this year and available for civilian consumption will be less than in normal years. Moreover, in the absence of sufficient supplies of sugar, household jam-making cannot be practised on so large a scale as usual. Therefore, it is to be hoped that everyone who has or can obtain fruit will preserve as much as possible. There are four ways in which this can be done:—

By jam-making with sugar or with sugar substitutes (for example glucose and corn syrup), drying, bottling and canning.

It is the object of this pamphlet to describe methods of canning suitable for use by those who grow or are able to obtain in their neighbourhood plentiful supplies of fruit and vegetables.

The Advantages of Canning.—In both bottling and canning, fruit and vegetables are preserved by heat-sterilisation—that is to say, the germs of decay present in the material to be preserved are destroyed by heat, and the fruits or vegetables thus sterilised are sealed in glass or tin vessels so that no germs can reach them from the outer air. The difference between the processes of bottling as ordinarily practised and canning lies in this, that in bottling, sterilisation is brought about by the heat of boiling or nearly boiling water, whereas in canning it is effected by live steam.

* Issued in the form of a Leaflet by the Food Production Department of the Board, to whom all inquiries should be addressed (72, Victoria Street, London, S.W. 1).

Inasmuch as bottles are easily cracked by a sudden rise in temperature, bottling must be done somewhat slowly; but the use of cans made of "tin" enables the canner to deal much more quickly with the material to be preserved, and canning is, therefore, recommended for those who wish to preserve large quantities of fruit or vegetables.

Although canning is practised on a commercial scale in this country, it has not hitherto been adopted generally by amateurs or small fruit growers. This is the more surprising in that canning is a method which has become very popular on the farms and homesteads of America.

One of the most successful small canning plants in use in America is that known as the "Royal Home Canner," an apparatus first introduced into this country by the late Mr. R. A. Yerburgh. Early in the present year the Agricultural Organisation Society drew the attention of the Food Production Department to this apparatus, and when it found that, owing to transport difficulties, it was impossible to import the "Royal Home Canner" in time for use this year, arrangements were made with the firm of Messrs. Brierley, of Manchester, for the manufacture of an apparatus modelled on the "Home Canner." Tests with the canner made by this firm having proved satisfactory, the Food Production Department approached the representatives of the American Government in this country and asked them if they might with propriety manufacture the apparatus here. A favourable answer having been received, orders were placed for the manufacture of several hundred canners of the "Royal Home Canner" type.

The canners, a consignment of which will be ready in the first week of August, may be purchased from the manufacturers through the Food Production Department.

Description of the "Royal Home Canner."—The apparatus is made of galvanised iron and consists of the following parts :—

(1) A covered boiler or steriliser with a device for the rapid generation of live steam.
(2) Trays.
(3) A grate for coke, coal or wood fuel.
Instead of these fuels, gas or an oil stove may be used for generating the steam.

The apparatus is readily portable and may be used in the orchard, thereby saving time and labour in the handling of fruit.

NOTE.—When about to be used and before the fire is lit, sufficient water must be placed in the steriliser to cover the bottom to a depth of from 3 to 4 in.; this depth of water must be maintained throughout the time of use.

The construction of the steriliser is such that the heat from the stove generates live super-heated steam which is distributed evenly throughout the steriliser. It is to the rapid production of steam that the efficacy of the apparatus is due.

Capacity.—The capacity of the canner is such that it takes at one charge 36 quart or 56 pint cans. Or, if preferred, the lower tray may carry cans and on the upper tray 28 2-lb. glass jars may be placed instead of cans. Tests made by the Food Production Department show that if reasonable care is taken and if the instructions given later (see p. 544) are followed, glass jars may be used on the upper tray without undue risk of breakage. This course is convenient when it is desired to make use of bottles as well as cans for preserving fruit and vegetables at the same time. In that case the vegetables (which take longer than fruit) are placed in the cans and the fruit is placed in bottles.

Time for Sterilising.—The time required for sterilising fruit is from 15 to 20 minutes; for vegetables it is longer (see p. 545).

Allowing two charges per hour, *upwards of* 600 *quart cans of fruit may be prepared in the course of a day.* Hence the apparatus should prove of the utmost use in fruit-growing districts, and, especially if owned and used co-operatively, it should enable societies or groups of individuals to prepare large supplies of preserved food.

Special Features.—The apparatus is—(1) portable, (2) economical of fuel, (3) rapid in action, (4) of large capacity, (5) adaptable to many uses besides canning. The products retain their colour and flavour and are of excellent quality.

Price.—The price of the canner with stove and accessories is £6 10*s.*, carriage paid.

Cans.—Arrangements have been made to supply purchasers with cans (2 lb. or 3 lb.) in 1 gross or 5 gross packages, up to the number of 10 gross.

The cans to be supplied are specially lacquered on the inside, so that the fruit or vegetables are prevented from coming in contact with the tinned surfaces. Thus the principal objection to the use of cans is removed.

Price of Cans.—English, 2 lb. size, per 1 gross, 35*s.* 6*d.*; per 5 gross, 33*s.* 6*d.* American, 3 lb. size, per 1 gross, 45*s.* 6*d.*; per 5 gross, 43*s.* Delivered in non-returnable crates.

Instructions in Canning.—For the benefit of those who are within reach of London, daily demonstrations, which will continue up to the middle of August, are being given at the Food Economy Exhibition, L.C.C. New County Hall, Westminster.

Instructions in the Country.—Purchasers of a canning plant may receive free instructions in its use on application to the Food Production Department. This application should be made when ordering the canning plant.

Canning.—Canning consists of two essential operations :

1. *Exhausting air from the cans.*

Exhaustion is effected in the following way : A can in which the fruit has been placed is filled with hot water and the lid (or cap) is soldered on. Meanwhile, the hot water has caused the air in the can to expand and hence some of the air is drawn out through the small vent hole in the middle of the lid.

If cold water is used to fill the cans exhaustion must be effected by placing each can after the lid has been soldered on in the steriliser for a short space of time—from 3 to 5 minutes.

2. *Cooking or Processing.*

The fruit or vegetables are sterilised by the operation known as cooking or processing. After the air has been exhausted the opening is closed or "tipped" by means of solder. The can is now hermetically sealed and ready to go back into the steriliser for cooking (processing).

Instructions.—1. *Cleaning the cans.*

Remove the dust by rinsing the cans with clean water.

2. *Filling.*

Fill them with fruit or vegetables. Shake the contents down and add hot water to within one-quarter to one-eighth of an inch of the top.

Work Table.

The work table on which the tins are to be soldered must be *perfectly level.* This is essential because the water (or syrup) in the cans must not touch the lid about to be soldered.

3. *Tinning the tools.*

The soldering iron must be "tinned" before use, otherwise the solder would not run smoothly.

First see that the copper of the soldering iron is bright and that the tip is not blunt, and if necessary lightly polish the copper with emery cloth or with a file. Heat the iron to a point at which solder applied to it melts instantly (*the soldering iron must on no account be red-hot*).

When heated to the right temperature, place the soldering iron quickly in the soldering fluid, touch the end of it with the solder and again dip the iron into the fluid when the solder will be found to run evenly over the surface of the "iron." Repeat these operations until the copper is coated evenly with solder. It is now tinned and ready for use. If the iron is too hot the solder flies from the surface; if too cool the solder does not melt

Practice in putting on lids.—Partly fill a cup with soldering fluid. Have ready a heavy damp cloth with which to wipe the edges of the soldering iron.

Place the lid on an empty can. By means of a brush or swab apply the fluid sparingly to the surface to be soldered, and by means of the soldering iron run in the solder so as to seal the lid.

Needless to say, the inexperienced should, if possible, get a tinsmith to show them how to solder.

4. *Putting on the lid.*

After the can has been filled, wipe the top dry and fit the lid on the opening. Hold the lid in place whilst applying the soldering fluid to the parts of the can and lid which have to be soldered. Tack the lid on to the can by melting, by means of the iron, a little solder at one point. Hold the lid firmly in place by means of a stick, tack at several points and then run the solder quickly all round the edge of the lid.

5. *Tipping the can.*

To close the vent hole in the middle of the lid, hold the soldering iron so that its point presses against the hole and touch it with the solder until enough melts to fill the hole. Always after finishing soldering wipe the surface with a wet cloth, to remove any fluid and to polish the solder. Remember the advice as to the need for a clean and pointed soldering iron and as to the temperature of the iron. Before using the iron wipe it with a damp cloth and dip its point in the soldering fluid.

6. *Testing cans.*

After they have been tipped, the cans should be tested. Immerse in hot water. A leak may be detected by the appearance of small air bubbles coming from the defective place. It must be stopped by soldering

7. *Processing* (*Cooking*).

The essential operation of canning consists in sterilising the contents of the cans by exposing them to the steam in the steriliser, and is done after the can has been hermetically sea'ed.

The lengths of time necessary for processing different fruits and vegetables are given in the recipes which follow.

8. *Preventing the rusting of cans.*

Cans must be kept dry and stored in a dry place. The surface of the cans may be lacquered. If labels are used, only the exposed tin surface need be lacquered. The lacquer must be applied by means of a brush before the cans get cold. Before lacquering make sure that the surface of the cans is dry.

10. *Cooling the cans.*

To stop cooking after the cans are removed from the steriliser, plunge them into cold water.

To Use Glass Jars for "Canning."—With proper care, ordinary screw top, rubber ring, glass jars may be used with the "Home Canner." The rubber rings should be good and springy; old and hard rubber is the cause of many failures, both in bottling and in canning.

Glass jars, containing the fruit and vegetables, must be filled cautiously with hot water; the rubber ring and top must be placed in position and the top screwed on, but not quite tightly. The jars are then put in the steriliser and allowed to remain rather longer than is needed for cans. When taken from the steriliser the tops must be screwed tight and the jars allowed to cool gradually, and should not be placed in a draught or in cold water.

Breakage, due to the glass jars knocking against one another, may be prevented by enclosing them separately in string or canvas bags.

Recipes.—The length of time and the temperature for sterilisation are different for each kind of fruit or vegetable.

Fruits require a shorter time than vegetables, and acid fruits less than others.

The times given in the following recipes are those required for pint or quart cans; gallon cans require double time; glass jars require considerably more time than cans.

For canning, all fruits must be picked whilst dry.

Apples.—Any variety of firm, late apple may be canned. Pare, slice or quarter, remove core and cover immediately with cold water to prevent discolouration. Fill the tins or jars with the fruit, add hot water, solder on the lid, seal the tip and put the cans in the steriliser for from 10 to 15 minutes according to the ripeness or hardness of the fruit.

Blackberries.—Remove leaves and stems; wash carefully to get rid of dust; pack tightly in cans, add hot water or syrup. Cap, tip and process for 10 minutes. If glass jars are used, process in steam for 20 minutes.

Cherries.—All varieties may be canned, but the Morello and other cooking varieties are best. The fruit may be stoned or canned whole. Pack the fruit in cans or jars, cover it with hot water or syrup made by boiling together equal quantities of sugar and water, cap and tip. For each 2-lb. tin process in steam in the steriliser for 15 minutes.

Gooseberries.—Green Gooseberries can well in water but not in syrup. If syrup is used the fruit should be firm and nearly ripe. Wash, tip and tail ; fill the cans, cover with hot water. Cap, tip and process in steam for 15 minutes.

Pears.—The fruit should be ripe but not soft. Cut in halves, peel and core. Sweet varieties should be covered with hot water, capped and tipped, and process for 15 minutes ; hard varieties should be covered with hot water or syrup and capped, tipped and process in steam for 20 minutes.

Plums.—Any varieties may be canned. The fruit should be well coloured but firm. Wash and pack in cans ; cover with hot water. Cap, tip and process in steam for 20 minutes.

Raspberries.—Remove the stalks. Fill the cans and cover the fruit with hot water or syrup. Cap, tip and process in steam for 15 minutes.

Red Currants.—Remove the stalks. Wash, pack tightly in cans, cover with hot water or syrup. Cap, tip and process in steam for 10 minutes.

Strawberries.—Strawberries should not be washed. Process in steam for 10 minutes.

Vegetables.—All the ordinary kinds of vegetables may be canned, but they need more time than fruits. The times which are given in the following recipes provide for the proper cooking of the vegetables. If the vegetables are not sterilised for a sufficient time they will not keep.

Scalding or Blanching.—Some vegetables require scalding (blanching) before canning, and for this purpose a large kettle of boiling water should be kept at hand. The scalding may be done in a wire basket, or in a bag made of common cheese cloth.

For the best results the scalding should be well done. Blanching softens the vegetables and also assists in the sterilisation. If it is neglected the canned vegetables are apt to be hard. This applies to peas as well as to certain other vegetables referred to below.

Cold Dip.—Immediately after scalding or blanching, dip the vegetables into cold water. This helps to preserve the colour ; for example, if runner beans are scalded for 2 minutes and dipped in cold water, the ultimate product is of a good green

colour. The cold dip also helps to prevent the canned vegetables from becoming too soft.

Asparagus.—Select new, tender stalks; cut into lengths to fit the cans. Wash thoroughly and blanch for 3 minutes. Dip immediately into cold brine (4 oz. of salt to a gal. of water). Pack into cans; cover with hot water; add a small spoonful of salt. Cap, tip and process in steam for 60 minutes or longer if the stalks used were not tender.

Beans.—Broad Beans.—Use beans not too ripe. Shell the beans and wash them in cold water; blanch for 15 minutes or for 10 minutes if the beans are very tender. Pack them in cans, but since beans swell, do not fill the cans too full. Add a small tablespoonful of salt; an equal amount of sugar. Cap, tip and process in steam for 60 minutes.

Runner Beans.—Wash, remove the strings and tip the ends, or cut into small pieces about an inch in length. Blanch for 2 minutes in boiling water; plunge into cold brine as for asparagus. Pack in cans, add a small spoonful of salt; cover with hot water. Cap, tip and process in steam for 60 minutes.

Carrots.—Select young tender carrots. Wash and scrape. Blanch in scalding water for 5 minutes. Slice or pack whole in cans or bottles; cover with hot water. Cap, tip and process in steam for 60 minutes.

Peas.—Shell, blanch the peas for about 4 minutes, till they begin to wrinkle. Pack them in cans; fill with water. Cap, tip and process in steam for 90 minutes. Salt and sugar may be added to the water and also an infusion of mint. To a pint of hot water add a lump of sugar and a small spoonful of salt and leave a sprig of mint in the water for 2 minutes. Pour the liquid over the peas in the cans.

Tomatoes.—Choose tomatoes of even size. Place them in the scalding tray and dip into boiling water from 30 to 60 seconds. Transfer immediately to cold water. Remove the skin and core, but if possible keep the tomatoes whole. Put them into cans and to each quart can add 2 teaspoonfuls of sugar and salt mixture. Cap and lower the cans into the steriliser and exhaust for 3 minutes in live steam. Take the cans out, tip and process them in steam for 20 minutes.

If glass jars are used, fill them with uniform, ripe, red, whole tomatoes, and process them in steam for 40 minutes. Test the jars by submerging them in the water and examine them after a few days to see that there has been no leakage. If air bubbles begin to rise, put the jars into the steriliser and re-process for about 5 or 10 minutes.

The sugar and salt mixture referred to above, consists of 2 cupfuls of sugar and 1 cupful of salt mixed well together.

Vegetable Soup.—Mixtures with vegetables to be used for soup may be canned. Each vegetable must be prepared as for canning, *e.g.* mix well—tomatoes, 2 parts; other vegetables, 1 part. Pack in cans whilst cold and add one large slice of onion to each can. Cap and exhaust for 3 minutes. Tip and process in steam for 1 hour.

NOTE.—After lowering glass jars into the steriliser for processing in steam, do not put on the cover of the steriliser for a few minutes, for if the cover is replaced immediately, the temperature will rise so rapidly as to cause the glass to crack.

THE thrifty will find in the practice of drying fruit and vegetables a useful means of increasing the winter food supply.

Fruit and Vegetable Drying.*

After the last meal of the day has been cooked, the heat of the oven, instead of being wasted, may be used to dry the surplus vegetables of the garden or allotment and so to prepare a store of winter food.

For drying on a small scale, one of two means may be employed :—

(1) In small drying machines.
(2) In the kitchen oven.

Drying Machines.—There are on the market several types of drying machines, such as Gnome, Invicta, Lightning, and British Evaporator. The chief advantage of a drying machine over the kitchen oven lies in the fact that such vegetables as carrots, turnips, parsnips, which require to be boiled or steamed before drying in the oven, may be dried in the drying machine without previous cooking.

Potatoes, whether dried in the drying machine or in the oven, must first be lightly cooked, preferably by steaming.

Instruments for peeling, coring and cutting may be obtained of the vendors of drying machines, but although essential for large quantities they are not necessary for use in oven drying.

Drying in the Oven.—Drying trays may be purchased ready made or may be constructed by nailing together in a square four wooden laths, and stretching wire gauze or canvas across the framework.

* Issued in the form of a Leaflet by the Food Production Department of the Board.

Drying must be done only in a moderately warm oven. After the oven has been used for cooking take out the oven shelf, put in the drying tray with its charge of fruit or vegetables, and leave it all night, repeating the drying again on the next evening if the material requires it.

Instructions for Drying.—*Apples:* All varieties may be dried, but the soft early kinds become of an unpleasant brown colour.

Peel, core, cut away bruised parts, slice in rings about a quarter of an inch thick. Place the rings thinly on the trays in the drying machine or thread them on string stretched across the laths of the drying frame.

When a drying machine is used the contents of several trays may be put on one tray as soon as the drying has caused them to shrivel, and the empty trays may be refilled.

Pears.—Choose fruit nearly ripe but not soft.

Peel; do not core but dry whole; otherwise proceed as with apples, replacing the fruit in the oven each evening until it is thoroughly dry.

Plums and Damsons.—Stalks and leaves should be removed from the plums, which should then be placed thinly on the tray. The heat may be raised to nearly 200° F., but care should be taken, if the fruit becomes soft and puffy, to prevent it from bursting. This is best done by withdrawing the trays and allowing the fruit to cool. As drying proceeds the temperature must be gradually lowered to about 140° F., otherwise the fruit will char; and for this reason, when it is thoroughly dry, withdraw the fruit from the oven and leave it exposed to the air for a few days until the plums, having taken up moisture from the air, are of the consistency of prunes. Pack them in clean, dry, well-stoppered bottles or in boxes lined with waxed paper.

The dried plums or damsons must be examined from time to time, and if any sign of dampness or mould appear they should be wiped with a dry cloth and put back again to dry in the oven for a short time.

It often happens that the sugar in the plums comes out of the fruit and appears as a whitish or pale grey powder. This is easily distinguished from mould by the fact that the plums with the powdering of sugar are *not* soft, and the sugar is in the form of a dry powder, whereas the mould is woolly in texture.

Except for the appearance the coating of sugar is no drawback to the quality of the fruit. When the plums are stewed the sugar of course is dissolved.

Cherries (without sugar).—Stone the cherries and set them in a pan over the fire with only the liquor that comes out of them. Shake well when they boil, put them in an earthenware jar. Next day scald them, and when cold, place them on sieves to dry in a warm, slow oven.

Potatoes.—By proper storage in a cool, dry, frost-proof shed, or failing that, in a clamp or pie—(see Royal Horticultural Society's Pamphlet on "The Cultivation of the Potato")—potatoes may be kept in good condition for many months, and therefore drying of potatoes is not to be recommended except where a drying machine is available for use.

To dry Potatoes in a drying machine.—Peel, cut in slices three-sixteenths of an inch thick. Cook *lightly* in boiling water or preferably by steaming, and stop the cooking before the potatoes begin to become floury. Spread the slices thinly on the trays and dry at a temperature just below 160° F. As the slices dry, the contents of several trays may be put together on one tray and the empty trays refilled.

Carrots, Parsnips, Turnips, Swedes.—Peel or scrape so as to remove the outer skin. Cut into slices three-sixteenths of an inch thick, or into shreds by means of a hand-grater. Steam for a few minutes, place thinly on the tray, and transfer to the oven. The temperature must not exceed 160° F., otherwise the vegetables will become brown.

Onions.—To avoid the unpleasantness of peeling onions immerse them in boiling water a minute. Peel, slice—do not steam. Dry as above.

Leeks.—Follow instructions for onions, but do not put them in boiling water.

Cabbage and other Greens.—After soaking in salt water as if for cooking, cut in half, remove the thick stems and heavy midribs. Slice as for pickled cabbage and place the pieces in the tray so that they lie loosely to the depth of one inch. To preserve a good colour the temperature should be about 140° F.

Spinach.—Follow instructions for cabbage.

Parsley.—Follow instructions for cabbage.

Peas and Broad Beans, Haricot Beans and Scarlet Runners.—The seeds may be dried in the oven; but the simplest course is to harvest them.

Dried Green Peas.—The best peas for drying are marrowfat peas. These should be gathered while still green and yet too old to serve as a vegetable. Place the peas in a pan of cold water to which is added a sprig of mint, half a teaspoonful of salt and a pinch of bi-carbonate of soda. Bring to boiling point

and allow them to boil for two minutes. Drain, dry carefully on a towel and place on trays. Dry in a cool oven. Pack in jars for storing.

NOTE.—Peas may be dried without the preliminary cooking. Shell the peas and dry them either in the sun or in the oven. When required for cooking, soak the peas for twenty-four hours, adding a pinch of soda to the water and boil until soft.

French Beans and Scarlet Runners.—Remove the strings, cut in strips, place in cold water to which a pinch of bi-carbonate of soda has been added. Drain place on the tray and dry as advised for cabbage.

Mushrooms.—Reject those with maggots. Wipe clean, remove skin, lay on paper sheets on trays.

Herbs—Thyme, Mint, etc.—Dry at a low temperature (not above 140° F.). There is no need to remove the stalks as the leaves easily separate when dry.

General Observations.

1. Observe scrupulous cleanliness.
2. Both with drying apparatus and oven, beginners should commence by drying small quantities at a time. Having gained experience as to the best temperature and the length of time required, the drying of large quantities may be undertaken.
3. Fruit should be ripe but not over-ripe, and should be in good condition.
4. Vegetables should be dried in their proper seasons and not after storage.
5. Sun heat in this country is rarely powerful enough for drying ; but *empty* greenhouses may well be used for drying purposes.
6. For use in soups and stews, soak the dry vegetables till they have regained their natural size, and add to stock.

Storage.—Dried fruit and vegetables must be kept in a *dry* place. The simplest way is to put the dry fruit and vegetables in stout brown paper bags and to hang the bags in the kitchen. If no thoroughly dry room is available store in tins or in air-tight bottles.

The dried products should be inspected from time to time and if dampness or mildew appears they should be wiped with a dry cloth and redried.

The more the light can be excluded, the less the colour is destroyed.

Production of Food in Urban Centres: Birkenhead.

BIRKENHEAD is a county borough with a registered population of 135,000, but, owing to the large influx of workers in shipyards and munition works during the War, has a real population of about 160,000. The town area is closely built over and because of the density of population (one of the highest in the country) the inhabitants have spread beyond the boundaries, to extend which a Local Government inquiry was held immediately prior to the outbreak of War. The demand for allotments within the area has always been keen, but, owing to strong local prejudice against them on account of their alleged unsightliness, the Council has repeatedly refused to exercise its power under the Allotments and Small Holdings Acts, rejecting, for example, during 1915 and 1916, no less than three motions to allow portions of its own land to be used for the purpose. It should be noted that in one respect the town is badly placed for allotment purposes, as a very large portion of its boundaries is made up of the River Mersey,

The repeated debates in the Council had the effect of familiarising the community with the allotment movement, and on the issue of the Land Cultivation Order, 1917 (which was immediately referred by the Council to the Allotments Committee with full powers to act), everything was ready for its application. The small Allotments Committee at once invited to its assistance representative farmers and horticulturists in the district, and expanded from a Committee of five persons to one of fifteen, later on adding thereto representative delegates from the allotment holders themselves. This Committee immediately :—

(1) secured stocks of implements in order to forestall any attempts to raise prices or any failure to obtain supplies ;
(2) obtained firm offers of seed and accepted quotations ;
(3) organised manure supplies ;
(4) arranged for bringing on under glass (in consequence of the late start) large quantities of plants for spring planting ;
(5) prepared schemes which were laid before the inhabitants.

The first movement was for the fullest possible increase in the number of allotments. An allotment appeals to the individualistic instinct of an Englishman ; the man upon it is working for himself, puts his best into it, helps

himself first and thereby relieves the market for other buyers. To every man or woman who desired one, an allotment was offered even if it should mean the closing of all parks and the breaking up of all recreation grounds. There was a large demand which continued steadily and was fully met, until in three months about 2,500 allotments were under cultivation within the borough. Practically every available area of land fit for immediate use was scheduled, let, and put under crop.

The principles on which the Committee worked were as follows :—

(1) To select and test all land, in order to make sure that it might reasonably be expected to carry fair crops. As a result, with the exception of a few isolated plots which called for additional labour and which are to be met with on almost on all newly-dug land, the prospects for the season are excellent.

(2) To charge an economic rent which would ensure serious cultivation, and enable reasonable assistance to be given in the development of areas by the proper laying out of the land and by the provision of water supplies and skilled advice where needed.

(3) To prevent, when necessary, individual actions which tend to spoil the work of the other allotment holders.

Every effort was made to weld the allotment holders together into a well-organised movement, self-supporting and mutually helpful. Committees were selected at open meetings for each group of allotments, and officials appointed to represent them, these in turn electing representatives upon the Central Committee at the Town Hall.

It was reasonably certain that with a great extension of garden work, implements would be scarce and might advance rapidly in price. One of the first things done, therefore, was to lay in a stock of spades, forks, hoes, etc., which, when the local tradesmen ran short or showed a tendency to raise prices, were put on the market with excellent effect. The same plan was followed with regard to manures. Efforts by traders to exploit the allotment enthusiasm were a complete failure largely owing to the action of the Committee in distributing at a fair rate the manures produced, manufactured or bought in by the Corporation.

In regard to seeds and plants, the Committee secured its seed potatoes through the Board of Agriculture, and in due time received an excellent supply, both in quality and quantity. All other seeds necessary for allotments were secured from one

of the large growers. These were tested, put up in suitable quantities and distributed at cost price. By the assistance of the owners of large garden establishments and of the Parks Committee, who cleared their greenhouses of flowering plants, large quantities of all varieties of *Brassica* were brought on and distributed. The difference in prices charged by the Committee and those charged by others indicated that allotment holders had been saved up to £1,000 in plants, seeds, implements, potatoes, and manures.

Side by side with the provision of allotments the Committee took up in other ways the work of food production. They turned to the assistance of the farmers near the town and, having enrolled Corporation workers who had agricultural experience, these were liberated for service on the land. The Committee organised all available labour, as for instance, those who have neither the time nor the inclination to work an allotment alone, yet who have time which might be given to working ground in common with others.

Schemes for school gardens to be used for food production were prepared and submitted to the Board of Education. There was at the time much criticism, but the Board approved and has since requested all school authorities to do similar work. The land was provided by the Committee and cultivation went on during school hours, by way of a lesson. Dr. Fisher, the President of the Board of Education, addressing the Association of Education Committees on 8th June in London, laid emphasis on the fact that experience has proved the educational value of the work now being done in the school gardens of the country. It was heavy work for the children at the start—trenching grass land in heavy loam can never be easy work—but the children desired to help in the national crisis, and to-day they have their reward in watching the growing crops.

Schemes were also prepared for men in essential employment who were slack on certain days during the week. The butchers at the lairages took in hand a disused nursery of 10 acres and were later joined by the employees of one of the brewery companies. The other brewery companies also took up large areas, using, under the direction of the Committee and their skilled men, the companies' horses and implements.

The Volunteers took up the land question and digging took the place of drill. The girls in works and factories did their part as did those engaged in large shops, the heads of the establishments arranging with the Committee for land and

organising their own staffs in cultivation. Men also who had been exempted by the tribunals gladly gave spare time to the work.

The idealist came to the front and an organisation was formed, " The Birkenhead Co-operative Cultivators," to work land in common for the general good. They took over a large field, and although a late start was made it was well planted with potatoes, which, at the time this note was written, were in a forward condition, with marrow plants in scores rapidly covering the waste heaps and hedges. In order that the wounded should not suffer from shortage, a large area of land was put under cultivation for free hospital supplies and worked by voluntary service.

Many private gardens were inspected for cultivation and the staff of gardeners who, at their employers' request and with their own good will, are co-operating with the Committee were kept busy through the planting season and are now spraying potatoes against disease, the necessary apparatus and materials having been secured early in the year.

In all communal schemes the Committee, realising that its work is production and not profit, employed no rigid standard. In some cases seeds and manure were provided, in others implements as well, and in all cases the land. From two-thirds to the whole of the resultant crops will become the property of the Committee for disposal as circumstances may direct.

In order to work up enthusiasm to the utmost, arrangements were made for an exhibition to be held during the present month, and the schedule of awards issued stipulated that as the awards were to encourage production, the produce shown must be representative of all the garden and must not consist of a few over-grown specimens put up for prize-winning. The allotments themselves were to be inspected for awards before the show was held. The various Committees of the Corporation, such as Electricity, Gas, etc., joined in to make it a complete " welfare " show.

Early in the year the National Housing and Town Planning Council circulated to local authorities questions as to how far a district could supply itself with its own garden produce. Only experience can fully answer such questions with accuracy. Birkenhead estimates this year to supply about one-fifth of the town's needs. Another year double the number of allotment holders might be cultivating their land, so supplying two-fifths. Then, given the land, there is no reason why the size of the individual allotment should

not be doubled—600 sq. yd. of land, once under cultivation, is none too large for a man to attend to in odd hours. That done, four-fifths of the town's needs would be supplied. Improved culture will do the rest. Such an outlook is, perhaps, ideal—what is possible is not always probable.

This much, however, can be said: the food shortage of 1917 has conferred upon our towns the inestimable advantage of experience in land cultivation and demonstrated to owners, authorities, and the general public, the possibilities in that direction. It is for allotment holders themselves to show that they are worthy of a permanent place in our civic development, not only by making their plots productive, but also by so maintaining the appearance of allotments, that these should not be an eyesore to the community and a disgrace to a district.

A Co-operative Cottage Gardens Association.*

A very interesting form of co-operation in horticulture between employer and employed is reported by the Agricultural Organisation Society in connection with the Buxton Lime Firms, Limited.

The Company in question has works situated in five different districts of Derbyshire, and the employees at all these works are linked up in the Buxton Lime Firms Cottage Gardens Association. Each district has a committee and sub-committees, and all are represented on the Grand Committee and the Executive Committee, of which the Managing Director of the Company is Chairman.

For 1*d.* per month rental an employee obtains 200 square yards of ground. For 2*d.* per month, he may have double the amount, and so on, up to the limit of his capacity as a cultivator. The Company gives potato sets free for the first plot, and other vegetable seeds and plants at half cost; if the man has a second plot half the potato sets for this are supplied for nothing, and other vegetable seeds and plants are again available at half price. Lime is given free and manure sold to the men at nominal figures. The Company pays half the value of prizes given for garden produce at local shows in which the employees are interested as competitors, and has granted £50 worth of prizes for gardens connected with schools to which the children of its workers go.

Moreover, 100 acres have been set aside for the collective benefit of the members of the Association, who are thus enabled to buy vegetables from the ground—a member may

* Communicated by the Agricultural Organisation Society.

take up one or more rows on payment of the actual cost of seeds and cultivation; in the event of a member or members declining to exercise this right the Association can sell the produce elsewhere and distribute the money obtained in whatever way is thought fit. Tools are supplied at cost price, and an expert market-gardener advises and instructs the allotment holders, who number about 1,000.

Many women work on the land, notably on the "common land" of the Association. When they become competent agriculturists they are presented with a uniform. They also keep rabbits, pigs, and goats co-operatively.

The idea seems worth the attention of other large concerns in a position to secure land at a reasonable price. It may be mentioned that among the various great capitalists of the country who have taken special measures to encourage co-operative agriculture and stock-keeping by their employees is Lord Rhondda, in connection with whose collieries an admirably conceived co-operative pig-keeping scheme has been set up.

Stoke Newington Allotments under the Cultivation of Lands Order.

ON the issue by the Board of Agriculture and Fisheries of the Cultivation of Lands Order, 1916, conferring (*inter alia*) on the London County Council powers to enter on land for the purpose of the Order, the Council of the Stoke Newington Metropolitan Borough deputed three of its members to deal with the matter, and the Stoke Newington Vacant Lands Cultivation Society was formed. On the 9th March, 1917, the Board delegated their powers directly to the Stoke Newington Council, and on the following day a piece of land in Green Lanes was entered and allotted to 25 cultivators. Subsequently lands comprised in Stoke Newington Common, Finsbury Park and Clissold Park, and some other lands, were placed at the disposal of the Society, who have allotted a total of 700 plots of 5 rods each, leaving 500 applicants for plots still unsatisfied.

Each cultivator pays 5*s.* for his plot, and 1*s.* for water which the Society laid on at a cost of about £70. In return for this payment each plotholder has received seeds, manures and plants of the value of 7*s.* 6*d.* The Society purchased seven tons of seed potatoes for sale to the plotholders, and arranged for potato-spraying on payment of a small charge. Condemned stores of wire were purchased for the purpose of fencing. The work of the cultivators has been carefully guided, with the

result that no part of the land is badly cultivated or wasted, and the state of cultivation compares well with that of lands more favourably situated. By the end of May vegetables were already being gathered for consumption.

In addition to the 700 plotholders the membership of the Society comprises about 180 persons who cultivate plots not provided by the Society, and the general enthusiasm of the members is shown by an attendance of 700 at each of the general meetings of the Society, and by a subscription list of £30, besides the provision of two silver cups, for an exhibition proposed to be held in September.

Notes on Feeding Stuffs for September: *From the Animal Nutrition Institute, Cambridge University.*

THERE is nothing of interest to remark as to changes in prices since last month. Notes as to the extent and character of supplies have been added to Table I. They show that at the present time there are fair supplies of millers' offals, palm kernel and linseed cakes, and Chinese beans, but that the supplies of most other feeding stuffs are small or irregular or entirely non-existent.

Horses.—Harvest will now be in full swing and horses will be getting an extra ration to keep them up to their work. The cheapest foods now available in fair quantities and suitable for horses are bran, pollards and palm kernel cake, which may be used to replace oats in the following proportions :—

Ten lb. oats may be replaced by 14 lb. bran, 10 lb. pollards, or 8 lb. palm kernel cake. Of palm kernel cake for horses we have no personal experience, but reports are to hand of its successful use. A ration of 5 lb. of pollards, or 7 lb. of bran, and 4 lb. of palm kernel cake might be tried as a substitute for 10 lb. of oats. Or a mixture of 5 lb. of oats with half the above quantities. Owners should introduce the palm kernel cake gradually.

Milking Cows.—Now is the time when cowkeepers should watch their grass. As soon as signs appear of the grass failing, the cows should be given extra food in order to keep up the milk yield, for cows in full milk seldom recover from a check caused by defective feeding in August and September. Green crops should be used where they are available, and a concentrated ration may also be necessary. Bran or pollards, ground nut cake where it can be bought, palm kernel cake, and linseed cake are the cheapest foods suitable for this purpose

TABLE I.

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of July.															
		London.		Liverpool.		Hull.		Bristol.		Glasgow.		Leith.					
		£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.
Soya Bean Cake	122·3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Decorticated Cotton Cake	126·3	22 0 0	Very small.	—	—	—	None	—	—	—	—	—	—	—	—	—	—
London-made Cotton Cake	71·9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Decorticated Cotton Meal	126·3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Decorticated Cotton Cake (American)	126·3	—	—	21 15 0	Limited	—	—	—	—	—	—	—	—	—	—	—	—
Indian Linseed Cake	123·1	21 15 0	—	21 15 0	,,	—	None	—	—	—	—	21 10 0	—	21 12 6	—	—	—
Russian Linseed Cake	123·5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
English Linseed Cake	120·1	22 2 6	Fair	22 0 0	Limited	20 10 0 9 per cent.	Poor.	—	—	—	—	22 0 0	—	21 17 6	—	—	—
Bombay Cotton Cake	65·3	—	None	16 10 0	Limited	—	None	16 2 6	Small	—	—	—	—	16 5 0	—	—	—
Egyptian Cotton Cake	71·9	16 7 6	Small	17 5 0	,,	15 10 0	Fair	16 12 6	,,	16 10 0	—	16 7 6	—	—	—	—	—
Coconut Cake	102·6	18 7 6	Very fair.	—	—	—	None	—	—	—	—	—	—	—	—	—	—
Palm Kernel Cake	96·1	17 0 0	Fair	15 5 0	Moderate	14 12 6	Fair	—	—	17 10 0	—	—	—	—	—	—	—
Palm Kernel Meal (extracted)	92·5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Ground-nut Cake	145·2	—	None	—	—	—	None	—	—	—	—	—	—	—	—	—	—
English Beans	99·5	21 9 6	Small	22 15 0	Fair	22 2 0	Poor	—	—	—	—	—	—	—	—	—	—
Bean Meal	99·5	—	—	—	—	—	—	—	—	25 0 0	—	—	—	—	—	—	—
Chinese Beans	101·2	11 1 6 (Horse beans)	Fair	21 18 8	Good	—	None	—	—	—	—	—	—	—	—	—	—
English Maple Peas	97·2	24 4 6	Very small.	—	—	27 15 6	Fair	—	—	—	—	—	—	—	—	—	—
English Dun Peas	97·2	22 9 0	,,	—	—	24 9 0	,,	—	—	—	—	—	—	—	—	—	—
Calcutta White Peas	97·5	29 2 0	Small	—	—	26 13 4	,,	—	—	—	—	—	—	—	—	—	—
American Maize	93·8	18 18 0 (Free)	Irregular.	—	—	—	None	—	—	—	—	—	—	—	—	—	—
Argentine Maize	94·2	18 18 0 (Free)	,,	—	—	18 13 4	Fair	18 0 6	—	—	—	—	—	—	—	—	—

TABLE I.—*continued.*

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of July.																
		London.			Liverpool.			Hull.			Bristol.			Glasgow.		Leith.		
		£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.	Supplies.	£ s. d.		£ s. d.		
Maize Meal	86·5	22 0 0	Irregular	—	—	19 10 0	Poor	—	—	—	—	—	—	—	—	—	—	
Maize Gluten Feed	121·6	19 10 0	Fair	18 10 0	Good	—	None	19 0 0	Small	—	—	—	—	—	—	—	—	
Maize Germ Meal	99·2	18 15 0	,,	19 10 0	Moderate	—	,,	—	—	—	—	—	—	—	—	—	—	
English Feeding Barley	83·0	21 0 0	Small	—	—	—	,,	—	—	—	—	—	—	—	—	—	—	
English Oats	75·4	19 15 0	Very small.	—	—	19 15 0	Poor	23 6 8	Fair	—	—	—	—	—	—	—	—	
Argentine Oats	75·4	22 17 0	Small	—	—	—	None	—	—	—	—	—	—	—	—	—	—	
Malt Culms	69·9	13 10 0	Irregular	—	—	13 0 0	Poor	—	—	—	—	—	—	15 0 0	—	15 10 0	—	
Brewers' Grains (dried)	84·5	18 10 0	,,	—	—	16 0 0	,,	—	—	—	—	—	—	—	—	17 0 0	—	
Brewers' Grains (wet)	21·1	2 10 0	Fair	—	—	1 10 0	,,	—	—	—	—	—	—	—	—	—	—	
Distillers' Grains (English)	101·2	19 0 0	,,	—	—	—	None	18 10 0	Small	—	—	—	—	17 10 0	—	—	—	
Distillers' Grains (French)	101·2	19 0 0	,,	—	—	—	,,	—	—	—	—	—	—			—	—	
Distillery Mixed Grains (wet)	20·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Egyptian Rice Meal	78·7	—	None	—	—	—	None	—	—	—	—	—	—	—	—	—	—	
Burmese Rice Meal	78·7	—	,,	—	—	—	,,	—	—	—	—	—	—	—	—	—	—	
Rice Bran	78·7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Wheat Middlings (coarse)	94·8	15 0 0	Fair	—	—	14 15 0	Fair	—	—	—	—	—	—	16 0 0	—	15 5 0	—	
Wheat Sharps	90·5	15 5 0	Small	15 5 0	Moderate	14 15 0	,,	14 12 6	Good	—	—	—	—	14 15 0	—	14 0 0	—	
Wheat Pollards	96·7	—	—	14 0 0	,,	—	—	—	—	—	—	—	—	—	—	—	—	
Wheat Bran	77·5	12 17 6	Fair	—	—	13 10 0	Fair	12 7 6	Good	—	—	—	—	14 0 0	—	13 15 0	—	
Wheat Bran (broad)	79·9	14 17 6	Small	14 2 6	Moderate	15 0 0	,,	13 5 0	,,	—	—	—	—	14 10 0	—	14 10 0	—	
Feeding Treacle	60·0	23 0 0*	—	22 10 0	,,	—	None	—	—	—	—	—	—	—	—	—	—	
Linseed	153·5	30 0 0	Small	—	—	36 10 0	—	35 0 0	Small	—	—	—	—	—	—	‡32 10 0	—	
Linseed Oil	250·0	58 0 0	Fair	†60 0 0	Moderate	56 0 0	—	5s. per gal.	,,	—	—	—	—	—	—	—	—	
Egyptian Cotton Seed	108·6	19 0 0	Small	—	—	19 0 0	—	—	—	—	—	—	—	—	—	—	—	
Bombay Cotton Seed	99·6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Cotton Seed Oil	250·0	—	—	†73 0 0	—	—	—	—	—	—	—	—	—	—	—	—	—	
Fish Meal	145·0	—	—	—	—	—	—	—	—	—	—	—	—	17 0 0	—	17 0 0	—	
Locust Bean Meal	80·0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	

* Only fine quality on spot offer. † In barrels. ‡ Crushed.

at present prices. Needless to say they should be used in the smallest quantity which will suffice for the purpose in view.

Cattle for Beef Production.—Prices have now been fixed for the fat cattle which are to be bought for army purposes as follows: prices per cwt. live weight—September 74*s.*,

TABLE II.

LONDON. PRICES PER FOOD UNIT.

	s.	*d.*		*s.*	*d.*
Chinese beans	2	2¼	Malt culms	3	10½
Brewers' grains (wet) ..	2	4½	Linseed	3	11¼
Wheat middlings ..	3	2	Argentine maize ..	4	0
Maize gluten feed ..	3	2½	American maize	4	0½
Wheat bran	3	3¾	English beans	4	3½
Wheat sharps	3	4½	Brewers' grains (dried) ..	4	4½
Decorticated cotton cake	3	5¾	Egyptian cotton cake ..	4	6¾
Egyptian cotton seed ..	3	6	English dun peas ..	4	7½
Palm nut cake	3	6¼	Linseed oil	4	7¾
Indian linseed cake ..	3	6½	English maple peas ..	4	11¾
Coconut cake	3	7	English feeding barley ..	5	0¾
English linseed cake ..	3	8	Maize meal	5	1¼
Wheat bran (broad) ..	3	8½	English oats	5	2¾
Distillers' grains (English)	3	9	Calcutta white peas ..	5	11¾
Distillers' grains (French)	3	9¼	Argentine oats	6	0¾
Maize germ meal ..	3	9½	Feeding treacle	7	8

TABLE III.

LIVERPOOL. PRICES PER FOOD UNIT.

	s.	*d.*		*s.*	*d.*
Wheat pollards	2	11	Maize germ meal ..	3	11¼
Maize gluten feed ..	3	0½	Chinese beans	4	4
Palm nut cake	3	2	English beans	4	7
Wheat sharps	3	3¾	Egyptian cotton cake ..	4	9½
Decorticated cotton cake	3	5¼	Linseed oil	4	9½
Indian linseed cake ..	3	6½	Bombay cotton cake ..	5	0¾
Wheat bran (broad) ..	3	6½	Cotton seed oil	5	10½
English linseed cake ..	3	8	Feeding treacle	7	6

TABLE IV.

HULL. PRICES PER FOOD UNIT.

	s.	*d.*		*s.*	*d.*
Brewers' grains (wet) ..	1	5	Argentine maize ..	3	10
Palm nut cake	3	0½	Egyptian cotton cake ..	4	4
Wheat middlings ..	3	1½	English beans	4	5½
Wheat sharps	3	3	Linseed oil	4	5¾
English linseed cake ..	3	5	Maize meal	4	6
Wheat bran	3	5¾	Linseed	4	9¼
Egyptian cotton seed ..	3	6	English dun peas ..	5	0¼
Malt culms	3	8¾	English oats	5	2¾
Wheat bran (broad) ..	3	9	Calcutta white peas ..	5	5¾
Brewers' grains (dried) ..	3	9½	English maple peas ..	5	8½

TABLE V.

BRISTOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	3	1½	Argentine maize ..	3	11½
Wheat bran	3	2½	Linseed	4	6¾
Wheat sharps	3	2¾	Egyptian cotton cake ..	4	7½
Wheat bran (broad) ..	3	3¾	Bombay cotton cake ..	4	11¼
Distillers' grains (English)	3	8	English oats	6	2¼

TABLE VI.

AVERAGE PRICES PER FOOD UNIT.
LONDON, LIVERPOOL, HULL AND BRISTOL.

	s.	d.		s.	d.
Brewers' grains (wet) ..	1	10¾	Argentine maize ..	3	11
Wheat pollards	2	11	American maize ..	4	0½
Wheat middlings ..	3	1¾	Brewers' grains (dried) ..	4	1
Maize gluten feed ..	3	2¼	English beans	4	4
Palm kernel cake ..	3	3	Linseed	4	4¾
Chinese beans	3	3	Egyptian cotton cake ..	4	7
Wheat sharps	3	3½	Linseed oil	4	7½
Wheat bran	3	4	Maize meal	4	9½
Decorticated cotton cake	3	5½	English dun peas ..	4	10
Egyptian cotton seed ..	3	6	Bombay cotton cake ..	5	0
Indian linseed cake ..	3	6½	English feeding barley ..	5	0¾
English linseed cake ..	3	7	English maple peas ..	5	4
Coconut cake	3	7	English oats	5	6¾
Wheat bran (broad) ..	3	7	Calcutta white peas ..	5	8¾
Distillers' grains (English)	3	8½	Cotton seed oil	5	10½
Distillers' grains (French)	3	9¼	Argentine oats	6	0¾
Malt culms	3	9½	Feeding treacle	7	7
Maize germ meal ..	3	10½			

TABLE VII.

GLASGOW. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	4	Wheat bran (broad) ..	3	7½
Wheat sharps	3	3	Palm nut kernel cake ..	3	7¾
Wheat middlings ..	3	4½	English linseed cake ..	3	8
Distillery mixed grains (dried)	3	5¼	Malt culms	4	3½
Indian linseed cake ..	3	6	Egyptian cotton cake ..	4	7¼
Wheat bran	3	7¼	Bean meal	5	0¼

TABLE VIII.

LEITH. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	4	English linseed cake ..	3	7¾
Wheat sharps	3	1¼	Brewers' grains (dried) ..	4	0¼
Wheat middlings ..	3	2¾	Crushed linseed	4	3
Indian linseed cake ..	3	6¼	Malt culms	4	5½
Wheat bran	3	6½	Egyptian cotton cake ..	4	6½
Wheat bran (broad) ..	3	7½	Bombay cotton cake ..	4	11¾

TABLE IX.

AVERAGE PRICES PER FOOD UNIT.

GLASGOW AND LEITH.

	s.	d.		s.	d.
Fish meal	2	4	Palm nut kernel cake ..	3	7¾
Wheat sharps	3	2	English linseed cake ..	3	8
Wheat middlings ..	3	3½	Brewers' grains (dried) ..	4	0¼
Distillery mixed grains (dried)	3	5¾	Crushed linseed	4	3
Indian linseed cake ..	3	6¼	Malt culms	4	4½
Wheat bran	3	6¾	Egyptian cotton cake ..	4	6¾
Wheat bran (broad) ..	3	7½	Bombay cotton cake ..	4	11¾
			Bean meal	5	0¼

October 72*s.*, November and December 67*s.*, January onwards 60*s.* The Food Controller has announced that corresponding prices will shortly be fixed for all other fat cattle, though probably not on a live weight basis, and there is no doubt that he will also fix prices for mutton and pork. He has also said that he would endeavour to reduce the prices of purchased feeding stuffs. This, however, will not be any great help to the beef and mutton producers, for the estimated supply of oil cakes is likely to be so small that it will hardly do more than satisfy the needs of the milking cows on a very moderate scale.

A certain amount of cake is however still available, and it is suggested that farmers should use a small cake ration for their more forward and younger cattle so as to bring them to the butcher before the grass goes. Older cattle will be more likely to make some sort of progress on the short commons which must be their lot in the winter.

Sheep.—Ewes should not be put with the ram until about Michaelmas, so that the lambing season may be deferred until there is a prospect of keeping the ewes and lambs without the use of much concentrated food.

Lambs and tegs in forward condition will go back on roots in the winter unless they get a fair ration of cake, which it may be impossible to provide. Farmers who consider the future will look over their lambs and tegs, and pick out all those which promise to be ready for the butcher before Christmas. These should get a little cake now so that they may come to the butcher before the shortage of cake gets worse. Lambs and tegs which do not promise to be ready for slaughter by Christmas should be run as stores during the winter and fatted next summer, since they are not likely to fatten in the winter without more cake than will probably be available.

Shearings and cull ewes should be kept as stores until they go on to roots for the winter. They will put on flesh in the winter on roots if helped with whatever dry fodder may be available.

Pigs.—There is at present a fair supply of wheat offals, and there will no doubt be a certain amount of chats from the second early potatoes. It will hardly be possible to cook these, on account of the coal shortage but if sliced or pulped and mixed with an equal weight of a mixture of 5 parts of sharps or middlings and 1 part of palm kernel meal or cake, they should form a useful change for pigs which have been on grass or green stuff.

TABLE X.

(1) Name of Feeding Stuff.	(2) Nutritive Ratio.	(3) Per cent. digestible. Protein.	(4) Per cent. digestible. Fat.	(5) Per cent. digestible. Carbo-hydrates and Fibre.	(6) Starch equiv. per 100 lb.	(7) Linseed Cake equiv. per 100 lb.
Foods Rich in both Protein and Oil or Fat.						
Ground nut cake	1 : 0·8	45·2	6·3	21·1	77·5	102
Soya bean cake	1 : 1·1	34·0	6·5	21·0	66·7	88
Decort. cotton cake	1 : 1·2	34·0	8·5	20·0	71·0	93
Linseed cake, Indian	1 : 1·9	27·8	9·3	30·1	77·1	101
Linseed cake, English	1 : 2·0	26·7	9·3	30·1	76·0	100
Cotton cake, Egyptian	1 : 2·1	15·5	5·3	20·0	40·0	53
Cotton cake, Bombay	1 : 2·5	13·1	4·4	21·5	37·6	49
Distillers' grains (English) / Distillers' grains (French)	1 : 2·9	18·7	10·2	29·0	57·3	75
Maize gluten feed	1 : 3·0	20·4	8·8	48·4	87·4	115
Brewers' grains, dried	1 : 3·5	14·1	6·6	32·7	50·3	66
Coconut cake	1 : 3·8	16·3	8·2	41·4	76·5	101
Palm kernel cake	1 : 4·5	14·1	6·1	48·9	76·7	101
Linseed	1 : 5·9	18·1	34·7	20·1	119·2	157
Bombay cotton seed	1 : 6·6	11·0	16·8	30·1	77·5	102
Fairly Rich in Protein, Rich in Oil.						
Maize germ meal	1 : 8·5	9·0	6·2	61·2	81·0	107
Rice meal	1 : 9·4	6·8	10·2	38·2	68·4	90
Rich in Protein, Poor in Oil.						
Fish meal	1 : 0·1	54·0	4·0	—	60·0	78
Peas, Calcutta white	1 : 2·1	23·3	1·1	45·9	66·9	88
Beans, English	1 : 2·6	19·3	1·2	48·2	67·0	88
Beans, Chinese	1 : 2·6	19·6	1·7	47·9	67·0	88
Peas, English maple	1 : 3·1	17·0	1·0	50·0	70·0	92
Palm-nut meal (extracted)	1 : 3·4	15·6	1·9	48·7	66·1	87
Brewers' grains, wet	1 : 3·5	3·5	1·5	8·6	12·7	17
Malt culms	1 : 3·6	11·4	1·1	38·6	38·7	51
Cereals, Rich in Starch, not Rich in Protein or Oil.						
Barley, feeding	1 : 8·0	8·0	2·1	57·8	67·9	89
Oats, English	1 : 8·0	7·2	4·0	47·4	59·7	79
Oats, Argentine	1 : 8·0	7·2	4·0	47·4	59·7	79
Maize, American	1 : 11·5	6·7	4·3	65·8	81·0	107
Maize, Argentine	1 : 11·3	6·8	4·3	65·8	83·3	110
Maize meal	1 : 13·0	5·5	3·5	63·9	77·8	102
Wheat middlings, fine	1 : 4·8	13·2	3·0	53·8	72·0	95
Wheat middlings, coarse or sharps	1 : 5·1	13·8	4·3	50·5	64·0	84
Wheat pollards	1 : 4·5	11·6	4·0	51·6	60·0	79
Wheat bran	1 : 4·7	11·3	3·0	45·0	49·7	65
Wheat bran, broad	1 : 4·7	11·3	3·0	45·4	48·1	63
Locust bean meal	1 : 22·1	4·0	0·7	69·2	71·4	94

OFFICIAL NOTICES AND CIRCULARS.

THE following Notice, dated 3rd August, 1917, was issued by the Food Production Department :—

The Nation's Food: The Revised Agricultural Programme for 1918.

The Press in general, and the agricultural Press in particular, is discussing freely the agricultural programme of the Government for 1918. Not all the writers of letters or articles on the subject seem to be aware of the exact terms of the demand now made by the Board of Agriculture on the farmers in the interest of the national food supply. Sir Arthur Lee, Director-General of Food Production, has therefore issued a statement giving not only the total figures of the revised agricultural programme for the country as a whole for next year, but the details for each of the counties in England and Wales.

The public is familiar with the statement, made more loosely perhaps in popular debate than in the original authoritative form, that the Government urged farmers to plough up an additional "3,000,000 acres of grass land." The public probably is not so generally aware that since the first declaration of this Policy of the Plough in the spring, the demand upon our agriculturists has been modified in material particulars. It is well for the purposes of profitable debate that the public should understand the programme to date, and why it has been revised.

In 1916 there were 5,730,000 acres under corn crops (wheat and barley oats, rye, beans and peas) in England and Wales. The Board aim at an addition to this area of 2,600,000 acres in the harvest of 1918—an addition of 300,000 acres has already been made. In 1918 the Board expect to secure 600,000 acres of potatoes as compared with 428,000 acres grown in 1916. Nearly one-half of this increase has already been obtained. To the area under mangolds and other fodders essential in the winter-feeding of cows it is proposed to add about 230,000 acres. The total additions to the crops which may be used either directly as human food or for the production of milk will thus be 3,000,000 acres as compared with 1916. On the other hand, reductions in the areas of temporary grass and in certain of the less important crops of arable land are proposed, so that the extra 3,000,000 acres of essential crops may, it is estimated, be secured by the ploughing up of about 2,000,000 acres of permanent grass. Over and above mountain and hill grazings, there was 16,000,000 acres under permanent grass in England and Wales in 1916; it is thus only necessary to plough one-eighth of our grass land when preparing for the harvest of 1918; and it may be estimated that quite one-fifth of this task has already been completed.

Various circumstances have combined to bring about this revision of the official programme for 1918. In the first place, the new policy has proved so acceptable in Ireland and Scotland that those two countries have contributed an increased corn production this year over the year 1916 and have arranged to add largely to their tillage for 1918. This factor has enabled the Government considerably to reduce its call upon England and Wales. Other factors in the situation have been the difficulty, without unduly interfering with the supply of man-power for the Army, the Navy, and munition and other essential services, of providing sufficient labour and machinery to carry out the whole of the Government's agricultural programme in one season.

The aim of the Government's revised plan (as it was the aim of the original) is to break up a sufficient amount of the poorer quality grass land that has fallen down since 1870 or thereabout to grow enough

cereals to "render the country self supporting in case of extremity." It has never been suggested that grass land only should be used to obtain the additional corn crops; some of these it was assumed would be grown on existing arable land. Many of the critics of the scheme seem to have lost sight of this latter fact, or to have concluded (which was not the case) that the Government was less eager to utilise the arable land more advantageously, by changing the rotation or by improved cultivation, or both, than to break up more grass. At the same time, the Board of Agriculture took the view that we could not reckon, under war conditions with a shortage of labour and fertilisers, upon any great increase next year over the average corn yields per acre of the ten years preceding the War.

The selection of grass land for plough, it should be noted, is in the hands of local men with special qualifications for deciding wisely and fairly; and it is hoped that public opinion will support the County Executives in a spirit of enlightened patriotism. Where the Executive finds it impracticable to break up as much permanent grass land as the Food Production Department suggests, it is open to them to substitute an additional area of temporary grass, although this is a course which obviously must be pursued with caution.

Unless the position of affairs should become unexpectedly more serious during the late summer, the official opinion is that with the good will of agriculturists generally, and a continuance of the energetic and public spirited action of the Executives, it should be possible to approximate very nearly to the ideal of an additional 2,600,000 acres of corn following upon the breaking up of about 2,000,000 acres of permanent grass.

STATEMENT SHOWING THE REVISED AGRICULTURAL PROGRAMME FOR 1918 FOR EACH COUNTY IN ENGLAND AND WALES.

County.	*(a)* *Corn Area Suggested for 1918.*	*(b)* *Increase in Corn Area over 1916.*	*(c)* *Estimated Area of Permanent Grass to be Ploughed.*	*(d)* *Percentage of Corn to Total Arable Area of 1918.*
ENGLAND.	*Thousands of Acres.*			
Bedford	105	22	20	63
Berks	135	38	33	66
Bucks	119	40	40	70
Cambridge	152	30	26	64
Isle of Ely	109	10	20	60
Cheshire	136	50	35	60
Cornwall	204	80	25	60
Cumberland	128	55	30	59
Derby	72	30	25	67
Devon	333	130	65	61
Dorset	121	50	40	61
Durham	107	40	25	64
Essex	381	80	62	67
Gloucester	176	70	50	65
Hampshire	246	80	50	60
Isle of Wight	20	6	3	65
Hereford	111	45	40	68
Hertford	153	33	25	68
Hunts	95	20	20	66
Kent	216	78	65	60
Lancs	171	58	40	61

County.	(a) Corn Area Suggested for 1918:	(b) Increase in Corn Area over 1916.	(c) Estimated Area of Permanent Grass to be Ploughed.	(d) Percentage of Corn to Total Arable Area of 1918.
ENGLAND—*continued.*	*Thousands of Acres.*			
Leicester	97	45	50	66
Lincs				
(Holland)	111	20	30	53
(Kesteven)	192	43	30	65
(Lindsey)	381	80	65	62
Middlesex	9	2	2	35
Monmouth	40	25	25	69
Norfolk..	506	95	40	62
Northants	147	50	57	69
Peterborough	21	4	4	68
Northumberland ..	146	70	55	63
Nottingham	165	50	35	65
Oxford	166	50	50	67
Rutland	27	8	7	69
Salop	178	65	50	65
Somerset	160	80	75	68
Stafford	132	60	55	64
Suffolk, E.	227	27	15	67
Suffolk, W.	159	18	10	64
Surrey	72	28	18	63
Sussex, E.	86	35	30	67
Sussex W.	96	30	25	64
Warwick	127	50	50	67
Westmorland	30	15	10	62
Wiltshire	196	70	48	65
Worcester	93	30	25	63
Yorks, E.R.	315	70	40	65
Yorks, N.R.	252	75	60	66
Yorks, W.R.	266	80	70	64
Total (England) ..	7,687	2,320	1,770	—
WALES.				
Anglesey	41	18	18	53
Brecon	37	19	19	65
Cardigan	77	23	23	63
Carmarthen	93	41	41	70
Carnarvon	35	16	16	56
Denbigh	71	31	31	62
Flint	34	17	17	63
Glamorgan	48	27	27	63
Merioneth	26	11	11	63
Montgomery	69	33	33	66
Pembroke	80	30	30	65
Radnor	31	14	14	60
Total (Wales) ..	642	280	280	—
Total (England and Wales)	8,329	2,600	2,050	—

(*Note.*—" Corn " includes wheat, barley, oats, rye, beans and peas.)

THE following extract is taken from a Letter, dated 1st August, 1917, which the President of the Board has written to a correspondent :—

Beef Production under War Conditions.

I am glad to have an opportunity of explaining a few of the misunderstandings that have arisen regarding the purchase of cattle for the Army.

The Board of Agriculture are well aware of the opinion of the farmers that the live stock of the country constitute one of our greatest national assets and that, in the interests of the future of agriculture, its numbers should be maintained. In consequence, the farmers feel that no large demand for meat should be drawn for the Army from home sources, because such an addition to the normal demands must inevitably result in a reduction in our flocks and herds. I need not say that from the point of view of agriculture I am in complete sympathy with these opinions, but when I consider the national necessity and the situation forced upon us by the War I am bound to tell you that we must act on other lines.

For three years, in spite of the enormous drain on our resources, in spite of a world shortage of supplies, and in spite of the German submarine, we have maintained our flocks and herds at an even higher level than in the days of peace. We alone amongst the belligerents have been able to do this. Both our Allies and our enemies have long had to make enormous encroachments upon their home supplies. Now, however, the time has come when for a few months at least we, too, are compelled to embark upon the same path, and for the first time to feed a portion of our Army on home-grown meat. This action is not taken by choice, but is forced upon us by the exigencies of War.

We are further fully aware that the farmer disagrees with the policy of the present Order with regard to the provision of meat for the Army, because it seems to call for the slaughter of immature stock. Here, again, I should be entirely with him in the view that it is wasteful to kill immature stock, though perhaps I do not accept the term immature for the cattle that are called for. What we want for the Army are cattle that are comparable to those slaughtered in the Argentine and other countries which supply our imports of meat, *i.e.* cattle that have not reached the degree of finish which in the past has reflected such credit on British graziers and has supplied our public with the finest meat in the world. And this for two reasons.

In the first place, prime beef is no longer economical for the country at large. The last stages of fattening are the most expensive in food, in the sense that more food, and especially more concentrated food, in the form of cake, is consumed in making 1 lb. of human food in the later than in the earlier stages of fattening. I am aware that to the individual this last stage has been the most profitable, because that alone has put the finish on the animal and given it the quality that secured a good price per stone for the whole animal. But the situation has changed even for the individual. As soon as a maximum price is fixed for beef (and broad national considerations compel this imposition of a fixed price), then the farmer cannot realise his extra return for prime quality and he must begin to lose money as soon as the animal ceases to make those increases in weight for the food consumed which are attained in the early stages of fattening. The nation can no longer afford prime beef, and it certainly will not pay the farmer to make prime beef at second quality prices.

Secondly, I must warn you again of the increased and increasing shortage of feeding stuffs. However little we like it, we must accept the fact that the needs of the War and the work of the enemy submarine have so reduced the tonnage available that none can be spared for cattle food. We are cut off from maize, from feeding barley, from oats, from foreign peas and beans, from foreign-made cake; even the oilseeds from which cakes are made at home are so reduced in amount that during the coming winter the supply of cake will be little more than is wanted for the milch cows. Of course I know that some parts of the country are more able than others to fatten cattle upon the produce of the farm—upon turnips and straw. All the same, feeding stuffs of any kind will be so short that cattle cannot be fattened to their former pitch, and the country must be supplied with as much meat as can be turned out half-fat rather than with a smaller quantity of the prime article.

It is not a question of agricultural policy, nor of the wishes of the farmer to carry on his business in the way he knows is best for it; it is the stern stress of the War to which every single interest, whether of an industry or an individual, must be subordinated. What agriculturists are called upon to do is to find meat for the people, even if the farmer becomes thereby less able to resume his normal business when war ceases. Farmers must trust the Departments of Agriculture to watch that the reduction in stock is not carried down to the danger point and to protect our most valuable element in the future reconstruction, namely, our pedigree herds and flocks.

One word about prices. I know you are not satisfied with what has been fixed. I am far from satisfied with them myself, but Agricultural Departments cannot push the claims of the farmer too far against the community, and we had to accept a compromise. I do not, and I am sure you would not, wish to see a position grow up in which the farmer could be represented as blackmailing the community in its need. No greater misfortune has happened in the relations of agriculture to the country at large than the wild rise in meat prices and the consequent speculation in store cattle and grass that has marked the last six months. We are bound to get back to the position of 1916 when the prices of second-class cattle did not reach 60*s*. until December, and though in the process many farmers, who bought this year in good faith, must lose money over their beasts, yet the price of 60*s*., low as it now seems, will admit of a profit to the grazier provided that the price of stores, which normally accounts for two-thirds of the cost of the finished beast, is brought down to a corresponding level. I should also point out that the price of 60*s*. live weight refers to Army cattle only and that the good farmer, who normally turns out his beasts with a higher proportion of dead to live weight than is sought by the Army, will obtain a better live-weight price than those published, because civil prices will be fixed upon a dead weight basis.

I am aware, only too painfully aware, how unwelcome the prices that have been fixed are to the agricultural community, how resentful many men feel at the losses with which they are faced—resentful to the point that they feel they will make no further effort to further the production of food. I beg of them to think twice before coming to any such determination; the level to which prices have been rising this year is not only a danger to the State but a danger to the continued prosperity of agriculture in that a bitter and indiscriminating current of public opinion was being set up against all farmers. The State has

definitely promised that, in future, farming and farmers will be of national concern; we might have seen all this ground we have gained swept away in one gust of popular anger. Anxious and difficult as the times have been, few farmers can honestly say that the War has not brought money into their pockets; let us write off any loss the Order may cause as a gift to the nation; we are all called upon to make sacrifices, and in the last resort every man must ask himself "Is my sacrifice adequate; is it as great as that of others?"

R. E. PROTHERO.

Compensation for the Ploughing up of Grass Land.*

THE following Circular Letter, dated 4th August, 1917, has been addressed by the Food Production Department to County Agricultural Executive Committees in England and Wales:—

SIR,—It had been hoped that special arrangements might be made to provide for any loss incurred by the conversion of grass land to arable cultivation in connection with the Food Production Scheme. Unfortunately, the proposals which had been framed for that purpose have been found impracticable. It is, however, open to landlords and tenants where a compulsory Order has been made for the breaking up of grass land, to apply to the Defence of the Realm (Losses) Royal Commission for compensation for any direct and substantial loss incurred or damage sustained by reason of interference with their property or business under the Defence of the Realm Regulations.

In order to safeguard the claims of both landlords and tenants where such loss is incurred the Agricultural Executive Committees should, in every case in which grass land is broken up, make an Order for the purpose under Paragraph 1 (*e*) of Regulation 2M. Such an Order should be made in cases where both parties consent to the breaking up as well as in cases where the landlord or tenant objects to the breaking up. The making of such an Order in every case will prevent those who break up land voluntarily from being put in a worse pecuniary position than those who object to doing so, except under compulsion. It is regretted that it should be necessary to recommend the making of Orders which have the appearance of compulsion upon those who agree to the breaking up of land at some sacrifice of their own interests and views in order to assist in increasing the food supply of the country, but it should be explained that the Order is rendered necessary only so that their claims may be safeguarded.

I am, etc.,

ARTHUR LEE, *Director-General.*

Exemption from Military Service for Men Employed on Farm Work.

THE following Memorandum, dated 18th July, 1917, has been sent by the Food Production Department of the Board to the Agricultural Executive Committees in England and Wales, and to the Board's representatives before the Appeal and Local Tribunals:—

1. It has been agreed that no men who were on the 1st of June, 1917, and are still employed whole-time on a farm on farm work of national importance shall be posted for service with the Colours, or

* See also *Journal*, June, 1917, p. 355.

called up for medical examination or re-examination, except with the consent of the County Agricultural Executive Committee, even though a substitute may have been provided or offered. This arrangement is referred to in this Memorandum as the "Agreement." The description "employed whole-time on a farm on farm work" covers men employed in agriculture as thatchers, drivers of engines or motor tractors (including tractor ploughmen), and market gardeners whole-time employed in producing food of a character and amount to constitute national importance. The description does not include work on a poultry farm or a market garden for the production of flowers or of fruit.

2. **Procedure as regards a Man whose Case has been Finally Disposed of by the Tribunals.**—If the recruiting officer knows that the man falls within the agreement, and that the County Agricultural Executive Committee would not consent to his being called up, no action will be taken by the recruiting officer, and the man will be allowed to remain in his civil occupation.

3. If the recruiting officer is in doubt, he will send the man a calling-up notice attached to which will be Army Form W 3618 on which the man can claim that he comes within the agreement, and which he will complete and return, at the earliest possible moment, to the recruiting officer. If the recruiting officer, from his own knowledge is satisfied of the accuracy of the claim on the particulars furnished, he will cancel the calling-up notice. If he is not satisfied, he will refer the case to the County Agricultural Executive Committee, sending Army Form W 3618 for the claim to be verified. The Committee will make inquiries and will, if clearly satisfied that the man is engaged whole-time on a farm on farm work and that his work is of national importance, and that he was already engaged on such work on the 1st of June, 1917, complete and send to the recruiting officer the Voucher A on Army Form W 3618 to that effect. On receipt of this voucher confirming the claim, the recruiting officer will cancel the calling-up notice. If, however, the Committee are not satisfied that the claim is warranted or if they consent to the man being called-up (see paragraph 13 of this Memorandum) they will complete and send to the recruiting officer the Voucher B on Army Form W 3618. In either case they will strike out the Voucher A or B which is inappropriate.

4. **Procedure as Regards Calling Up of Men for Medical Examination or Re-examination.**—Procedure similar to that outlined in the foregoing paragraph will be followed in the case of a man who, being engaged whole-time on a farm on farm work of national importance, is called up for medical examination or re-examination.

5. **Cases in which the Calling-up Notice may be Enforced.**—It is essential that the Executive Committee should deal with cases with the least possible delay. If the recruiting officer has not received a voucher confirming the man's claim within three weeks from the date on which the Army Form W 3618 is sent to the Committee by the recruiting officer, or if the Committee do not confirm the man's claim, his calling-up notice will be enforced.

6. **Procedure as regards Men whose Cases have not been Finally Disposed of by the Tribunals.**—(*a*) *Men who hold Absolute or Conditional Certificates of Exemption.*—Before application is made to a Tribunal by

the military representative for the withdrawal of an absolute or conditional certificate of exemption held by a man whose case may be one covered by the agreement, the case will be referred by the Local Military Authorities to the County Agricultural Executive Committee, and if he is a man to whose calling up the Committee would not be prepared to consent, and to whom they would be prepared to issue a voucher that he comes within the agreement, no application for the withdrawal of the certificate will be lodged with the Tribunal (see, however, paragraph 10 of this memorandum).

7. (*b*) *Men who hold Temporary Certificates of Exemption, or who have not yet made Application to the Tribunals.*—Although men covered by the agreement will not be liable to be posted for service with the Colours, even if they do not apply for certificates of exemption, or for renewal of existing certificates, yet it is very desirable in their own interests that such men should make full use of their statutory and other rights by applying to the Tribunals for formal certificates of exemption or for renewals thereof. In this connection, it is necessary to emphasise the fact that there is no provision enabling a Tribunal to hear an application made out of date for the renewal of a certificate of exemption. The periods within which application may be made by a man attaining the age of 18 and within which application for a renewal of a certificate of exemption may be made are set out in the Notice A 198 (*b*)/L issued by this Department, dated the 20th March, 1917.*

8. In order that the Agricultural Executive Committees and the Tribunals may work together, and in order to avoid any unnecessary waste of time of the farmer and his employees, a form of procedure has been suggested by the Local Government Board to the Tribunals with regard to applications or appeals for agricultural workers now before or which may later come before the Tribunals.

This procedure is set out in a Memorandum R144† which has been issued by the Local Government Board to Tribunals, a copy of which is enclosed so that the Agricultural Executive Committee may be aware of the method which will be adopted by Tribunals in dealing with applications or appeals.

9. In view of the arrangements outlined in the enclosed Local Government Board Memorandum R144, it is suggested that the Agricultural Executive Committee should consider afresh the desirability of nominating suitable gentlemen to act as agricultural representatives before any of the Local Tribunals in their county which at present have no such representative.

10. **General.**—If the recruiting officer objects in any individual case to the decision of the Agricultural Executive Committee, he will send particulars to the War Office, who will refer the matter to the Food Production Department.

11. If a man engaged whole-time on a particular farm on farm work, changes his place of employment, the previous voucher issued by the Agricultural Executive Committee will cease to be of effect, but they may issue a voucher for his new employment if this warranted.

12. As a general rule it will not be necessary for the Agricultural Executive Committee to inquire into the case of an individual man with a view to the issue of a voucher except

(*a*) Where the recruiting officer refers the case to the Committee (see paragraphs 3 and 6 of this Memorandum);

* See *Journal*, April, 1917, p. 103. † Not here printed.

(*b*) Where the case is referred to the Committee as a result of an application to a Tribunal for a certificate of exemption or the renewal of a certificate of exemption (see Local Government Board Memorandum R 144 enclosed).

13. The effect of the agreement is that no man whole-time employed on a farm on farm work can be removed from his civil occupation without the consent of the Agricultural Executive Committee. It will, however, be the duty of the Committee to notify the military authorities that a particular man is not entitled to the benefit of the agreement in the following circumstances :—

(1) If the Committee are satisfied that the man's work is not of national importance ;

(2) Where the man is employed on a farm on which there is an excess of labour, unless

(*a*) Within three weeks from the date on which the case was referred to the Committee they have specified a farm to which the man is to move within three weeks of the date of the Committee's notification to the man, and

(*b*) The Committee are satisfied that the man will move as directed.

If the man does not move within the time specified, the Committee will notify the recruiting officer that he is not entitled to the benefit of the agreement.

14. This Department understand that cases have occurred in the past where Agricultural Executive Committees have purported to issue instructions to recruiting officers and have even given directions where a man has already been posted for military service that he is not to report. It must be clearly understood by Committees that they have no authority to give such instructions or directions. In any case in which the Committee are of opinion that the recruiting officer is acting improperly, the matter should at once be referred with full particulars to this Department. The matter will then be taken up at once with the War Office, who have undertaken to have immediate inquiry made in order that every matter may be adjusted forthwith.

15. Copies of a form of Voucher F.P. 84 to be used by County Agricultural Executive Committees in cases other than those in which Army Form W 3618 is referred to them by the recruiting officer have been printed and will be supplied on application to this Department.

ARTHUR LEE,
Director-General.

THE following Memorandum, dated 25th July, 1917, has been issued by the Food Production Department of the Board to Agricultural Executive Committees :—

Employment of Civilian Prisoners of War.*

Agricultural Executive Committees are notified that the Home Office have agreed that when persons employing Civilian Prisoners of War under the conditions laid down in the Leaflet A/206/L† are prepared to pay them a wage of 25*s.* a week or over, the amount to be deducted in respect of the cost of board and lodging may be increased from 12*s.* 3*d.* to 15*s.* a week.

* See *Journal*, May, 1917, p. 242, and Feb., 1917, p. 1134.
† Not here printed.

THE following Circular, dated 19th July, 1917, has been addressed by the Food Production Department of the Board to Agricultural Executive Committees in England and Wales :—

Labour for the 1918 Programme.

SIR,—1. I am directed to acquaint you that arrangements have now been made by which a large number of soldiers will be made available in the course of the next few weeks for work on the land in connection with the Programme for increased cultivation for the 1918 harvest. These men will be made available gradually and will be sent to Agricultural Distribution Centres (with which the present Agricultural Depots will be incorporated) conveniently situated for each county.

2. The arrangements contemplated by the Department include the supply of :—

(*a*) Horses with soldier ploughmen to be let out for fixed periods (according to scale) to farmers who are materially increasing their corn area for 1918, but are unable to carry out the work without this assistance ;

(*b*) Horses with soldier ploughmen working in gangs equipped with necessary implements who will deal with small areas (less than eight acres) of corn land which farmers cannot undertake without such assistance ;

(*c*) A limited number of experienced men to farmers who have or will undertake to increase materially their acreage of corn land, but who cannot do so without the help of experienced men, but have both horses and implements available for the purpose ;

(*d*) A limited number of experienced men to farmers who without such assistance would have farm horses standing idle entailing a less area of their arable land being cultivated for the 1918 harvest ; and

(*e*) Unskilled labour to farmers requiring such men for work in connection with the 1918 harvest.

3. *In distributing this labour, Committees must bear in mind that the supply is limited*, and cannot be augmented, so that every care must be taken to see that it is placed where it is most likely to lead to an increased acreage of land being cropped for the 1918 harvest. Special care should be taken to prevent soldier labour being allocated or used in such a way as to displace any women already employed on the land. Indeed, a proved willingness to employ available women workers should be held to constitute a preferential claim for additional soldier labour if the latter is needed. If distributed without proper care and judgment, farmers who are anxious to assist their country by adding to their arable land may be left unaided at the expense of those who merely require the additional labour to overcome present inconvenience in working their holding. Therefore, before approving any application, Committees must obtain information as to the additional acreage to be cropped. Copies of a new application form (which will supersede F. P. 71 and F. P. 11) will be sent to you as soon as possible, but until these are received the form F. P. 71 should be used.

4. Some difficulty may be experienced by this Department in immediately equipping men for work under sub-paragraphs (*a*) and (*b*) above, and, as it is most important that none of the men should be kept idle, your Committee should take immediate steps with a view to at once placing men under the conditions outlined in sub-paragraphs (*c*),

(*d*) and (*e*), always bearing in mind the importance of securing that a due proportion of the county task must be undertaken by any farmer availing himself of this source of labour. In all probability many farmers who are entitled to the services of these men will be unable to commence operations before harvest, but if they are in need of additional men for harvest there is no objection to their having the men forthwith at the rates of wages laid down for harvest work. These soldiers are allotted, subject to military exigencies, for permanent employment in connection with the 1918 programme but as regards the men out on harvest work re-allocation among the various counties may be necessary after harvest.

5. An Army Council Instruction is now in draft placing all soldiers now on the land under the same terms and conditions, which will be substantially those in F. P. 71. A copy of this Instruction will be sent to you as soon as it is issued.

6. The scheme referred to in paragraphs 2 (*a*) and (*b*) under which ploughmen, horses, harness and implements are to be supplied for work under the control of your Committee is being sent to you in the course of a day or two.*

7. It is expected that a first instalment of men with a knowledge of agriculture, or used to handling horses, will be made available for your County early next week at the Distribution Centre at
About unskilled men will also become available at the same time. The Department is instructing its Commissioners to confer with the Authorities and examine on arrival the skilled men to ascertain whether they appear to possess the necessary agricultural experience.

8. Immediate steps should be taken by means of the issue of posters and advertisements to inform farmers of the expected arrival of these men and your Committee should take every possible measure to see that they are immediately taken up on arrival. The despatch of further instalments of men will depend on the rapidity with which men already sent are taken up.

I am, etc.,
ARTHUR LEE,
Director-General.

THE following Memorandum, dated 23rd July, 1917, has been sent by the Food Production Department of the Board to Agricultural Executive Committees :—

Labour for the 1918 Programme.

A copy of the scheme referred to in paragraph 6 of the Circular Letter (C. L. 6)† of the 19th instant is enclosed herewith. Printed copies will be sent to you almost immediately, together with a supply of the necessary forms and cards.

Your Committee should inform the Department as soon as possible of the number of men and horses that can be employed under the scheme immediately and the implements, if any, required to be furnished with such teams. Committees must, however, bear in mind that only a small supply of horses and implements will be available during the next two weeks Further demands for men, horses, and implements can follow at later dates when contracts have been signed or work arranged for gangs of teams.

* See below. † See above.

None of the soldiers arriving at your distribution centre early next week should be kept back for this scheme as it is imperative that all these men should be got out on to the land as quickly as possible. Further drafts of skilled soldiers will be sent to the centre from time to time for the purposes of the scheme.

Ploughmen and Teams for Bringing Additional Land under Cultivation.

THE following Scheme for supplying teams of horses in charge of ploughmen to farmers requiring assistance to bring additional land under cultivation has been drawn up by the Food Production Department of the Board. It is dated July, 1917 :—

1. The Department suggest that for this scheme County Executive Committees should use the Rural District or other area for which District Committees have been formed as the unit of working, and that they should entrust the immediate distribution and supervision of the teams they may allot to each district to the District Committee. The District Committee should nominate some of their members to exercise such direct supervision as may be necessary in connection with any gangs of teams working in their locality.

2. The scheme contemplates that the ploughmen and horses should be utilised in two ways :—

(*a*) by loaning them for a period of one month or over to farmers who have undertaken to add 8 acres or more to their corn area, and have implements available for the purpose ;

(*b*) by working in travelling gangs to assist farmers who have areas of less than 8 acres to be cultivated. These gangs will ultimately be equipped with ploughs, cultivators, harrows, rolls, drills, etc., as well as a cart or lorry, all of which will be placed under the Committee's control.

In preparing the scheme for the County as a whole, the Department have allowed for approximately one-half of the teams being equipped and worked in gangs.

Committees may also use horses and men under this scheme for working any land they have entered upon, the usual charges being made against the funds provided for the scheme under which the land has been taken.

(A) *FARMERS WHO HAVE UNDERTAKEN TO ADD EIGHT ACRES OR MORE TO THEIR CORN AREA.*

3. Teams should be loaned only to farmers who have agreed to increase their acreage of corn crops by 8 acres or more, and who the Committee are satisfied would be unable to undertake the whole of the task allotted to them without extra assistance. The basis of allotment is that a team cannot be loaned for a longer period than one month for each additional 8 acres which the farmer intends to crop, but would be unable to do so without this extra help. Where a farmer has already broken up the area forming his task without extra assistance, but in doing so has got into arrears with his ordinary work, he may be allowed the loan of a team for the period to which the scale entitles him.

The Committee may consider joint applications from neighbouring farmers who are entitled to assistance under the above conditions provided the team or teams are accommodated on the same farm throughout the period of hire.

4. Teams will be loaned to farmers by the Committee on the following terms, and the farmer must sign a contract (F.P. 93)* agreeing to the terms before a team is sent to him. Preference should be given to farmers able to provide good accommodation for men and horses :—

(*a*) Payment for the team must be made at the rate of 12*s.* per week for each horse, except in the months of December and January, when the charge may be reduced to such a price as the Executive Committee think fit, but not below 7*s.* 6*d.* per week per horse. The farmer must report to the Committee the arrival of the team and forward at the same time one-third of the amount due, and the balance at the conclusion of the period of hiring.

(*b*) The farmer must provide good stabling and food for the horses, and must work them fairly for reasonable hours only, and keep them in thoroughly good condition and properly shod. He must also provide the necessary materials for keeping the harness in good order.

(*c*) A soldier or other ploughman furnished by the Agricultural Executive Committee must be allotted to take charge of each team of horses, and the horses provided by this Department must not be sent out except in the charge of such a ploughman. When a team is loaned to a farmer, he must find board and lodging for the ploughman and pay him the local rate of wage for a skilled ploughman, deducting 16*s.* a week for his board and lodging.

(*d*) Unless the farmer can satisfy the Committee he has already ploughed up the additional acreage he has promised to crop for the 1918 harvest before hiring the team, he must undertake to fill up and send to the Committee at the end of each week on a card to be provided for the purpose a report showing the progress he has made during the week If the weekly reports indicate that he is failing to make reasonable progress with the work the team must be withdrawn.

5. When the whole operations of ploughing, cultivating, drilling, etc., cannot be completed during the period for which the horses are loaned, the farmer will be able to use the horses to get ahead with other horse-work, and thus be able to manage any subsequent operations with his own horse strength.

(B) *FARMERS WHO HAVE LESS THAN EIGHT ACRES OF ADDITIONAL ARABLE LAND TO DEAL WITH.*

6. Where a farmer is unable to plough up and cultivate an additional area less than 8 acres in extent, without assistance, he should notify his District Committee, who, if satisfied that such assistance is necessary, should arrange to do so many "Horse-days" work for him in breaking up the land, or otherwise assisting him with seasonal horse-work on his farm or holding as he may be entitled to, on the basis of three days' work to be done for every acre of additional corn area.

7. The District Committee will arrange for the cultivation of these small areas of land by travelling gangs, who will be either ploughing, cultivating, harrowing, etc., as the season or condition of the land permits. Temporary centres must be arranged convenient for the

* Not here printed.

work, where horses and implements can be accommodated and near which billets can be found for the ploughmen.

8. The number of teams in a gang will vary according to the programme it has to cope with; but small gangs of three or four teams should form a working unit and be placed in charge of a senior ploughman (to be paid 3*s.* a week more than the others), who, besides working a team will be responsible for the men working proper hours, and for the good condition of the horses. As far as possible a N.C.O. should be selected as senior ploughman, if possessed of the necessary qualifications.

9. The implements and horses with these travelling gangs must be temporarily accommodated in convenient centres, either on farms centrally situated for the area being worked, or in a village.

10. The District Committee must arrange the programme for the gangs in their area, and for someone to visit each gang at least once a week, to see that the work is progressing satisfactorily, and for the payment of the men's wages each week. The senior ploughman must send a weekly return showing the land dealt with to the local representative nominated by the District Committee for his approval and transmission to the Executive Committee.

11. For ploughing, cultivating or other work done, an inclusive charge must be made of 5*s.* 6*d.* per working day for each horse and the local rate of wages for the ploughman, as well as 1*s.* per day for the use of the implements with each team. On days when tillage operations cannot be undertaken steps should be taken to secure that the Government horses and ploughmen are employed on some other work for farmers or, failing this, some other employer at equivalent rates.

When a ploughman is working with a gang he should be paid by the Committee 1*s.* a week in excess of the local rate of wages for a ploughman, as his living expenses will usually be greater than when continuously working with a farmer.

GENERAL INSTRUCTIONS.

12. The soldier-ploughmen supplied in connection with this scheme will be attached to an Agricultural Company stationed at an Agricultural Distribution Centre from which they will be sent out in the first instance to take over the horses at an Army Remount Depot, where the horses will be equipped with plough harness.

13. Before a ploughman is drawn from the Distribution Centre a representative of the Committee should interview him to ascertain if he is used to ploughing. If satisfied that he is suitable the Committee's representative should complete and hand to him a Reference Card (A) (F.P. 94). At the same time the Committee's Reference Card (B) (F.P. 95) is to be completed, and also the Card (C) (F.P. 96), which is subsequently to be sent to the Food Production Department. The Committee's Reference Card (F.P. 95) should be retained in the offices of the Committee for reference, and all subsequent movements of the ploughman either to another employer or District Committee should be entered on this card. The man's registration number will, in the case of soldiers, be his regimental number, and in the case of policemen, his police number.

14. To avoid any hitch occurring when horses are drawn, a representative of the Executive Committee must attend at the Remount Depot to ensure that all necessary arrangements are made. The horses

will be fitted with plough harness at the Depot, and it will be the duty of the Committee's representatives to see that the horses and harness are satisfactory before being despatched. Arrangements for any railway trucks necessary for the despatch by train of horses with necessary harness will be made by the Remount Officer, the Committee having previously informed him of the places of destination of the horses and the date on which it is desired they should be despatched. The Remount Officer will complete the Horse Reference Card (D) (F.P. 97) and hand it to the representative of the Committee. He will also complete the Horse Reference Card (E) (F.P. 98) and send it to the Food Production Department. The cards have been designed so that a record may be kept by the Committee of the exact location of each man and horse. It is essential that this record be kept fully and accurately.

15. The Agricultural Executive Committee must make the necessary arrangements for the ploughman to take over his team, and must supply him with the name and address of the person to whom he is to report himself. The Committee will also issue any railway warrant required for man and horses and notify the farmer of the day and probable time of arrival.

16. At least one clear week's notice must be sent to the Food Production Department by the Agricultural Executive Committee of the number of ploughmen, horses and implements required, and the date on which they wish them to be despatched. Committees should have in view sufficient work to keep each team fully employed before sending in a request for more men and horses.

17. Employers should be given as long notice as possible of the date on which a team will arrive, and the ploughman in charge of the team should also be informed at least seven days beforehand of the name and address of his next employer. Movement from one farm to another will usually take place by road, but in exceptional circumstances where railway transit is necessary railway warrants should be issued, and the necessary horse-box arranged for beforehand.

18. It is essential that no time should be wasted by men or horses. Committees should always reserve some non-urgent work in convenient localities, for instance, work on farms they have taken over, on which to employ teams temporarily disengaged. Accommodation for both men and horses should be arranged for provisionally in case intervals occur during which they are not employed.

19. Committees should arrange with Veterinary Surgeons in various parts of the county in order that their services will be available when required in the event of illness of, or injury to, any of the Government horses.

20. Periodical inspection of the horses loaned to the farmers or doing gang work should be arranged for in order to ensure that the horses are kept in good condition, and the harness in good repair.

21. Necessary repairs to saddlery and the purchase of additional horse tackle required should be arranged for locally by the Executive or District Committee. The Committee should arrange for any necessary repairs to farm implements under their control, and for plough shares and spare parts to be obtained from local firms.

22. Executive Committees may prescribe rations for horses loaned to farmers in any case where they deem it necessary. In the case of horses working in gangs, in order that the condition of the horses may

not be adversely affected by too frequent a change of rations owing to movements into new working centres, the Committee may arrange for corn, etc., to be supplied regularly from one source.

The Committee may fix according to the season the price to be paid by the District Committee to farmers and others for the stabling and feeding of horses employed on gang work. The price should not, however, in any case exceed 20*s*. per week at any period of the year if all provender is found by the person supplying the accommodation. Suitable deductions must be made therefrom for any corn, etc., supplied by Executive or District Committees.

23. When a team is on loan to farmers, the employer must insure the ploughman under the Workmen's Compensation Acts. It will not be necessary for men working directly under the Committee on gang work or on land taken over to be insured by them under these Acts. No Health Insurance Contributions will be payable. No Insurance of Horses will be necessary.

24. Executive Committees must send to the Food Production Department during the first week of every month a return on (F.P. 99) showing (*a*) the increased corn area dealt with by farmers to whom Government horses have been loaned, and (*b*) the increased corn area dealt with by horses working in gangs, together with a brief summary of receipts and expenditure under the scheme.

INSTRUCTIONS AS TO ACCOUNTS.

25. Charges for use of teams will be collected by the County Executive Committee and duly brought to account in the quarterly account rendered to the Department.

26. Payments by the Committee under this scheme will in similar manner be included, under appropriate heads, in the quarterly account.

27. It is anticipated that as a general rule "incomings" will be available to meet "outgoings," and consequently that the Committee will not need to apply to the Department for a grant in respect of these outgoings. If in any instance this should prove not to be the case, this Department will be prepared to place the Committee in funds to meet outgoings.

Local Supplies of Agricultural Implements and Harness.

A LETTER, dated 12th July, 1917, was addressed by the Food Production Department of the Board to Agricultural Executive Committees to the effect that :—

It is believed that it may be possible to obtain locally a proportion of the implements and equipments required for the tractors and horses which will be distributed during the next few months. The Department have placed large orders for ploughs, other implements and harness, but the present state of all manufacturing industries makes it difficult to obtain early delivery. This circumstance, apart from the desirability of making use of every implement and article of equipment already available, renders it necessary to purchase or bring into use whatever can be obtained locally and is in a serviceable condition. I am, therefore, to ask that the Agricultural Executive Committee will make inquiries and will furnish the Department with particulars of any ploughs or other implements required by your Committee which are actually available in the county, either in local dealers' stocks or on farms, and which are not in

use at present. On receipt of this information the Department will authorise the Committee to purchase such proportion of their total requirements as is locally available and the balance will be procured by the Department from the manufacturers. If there is any quantity of second-hand implements which can be made serviceable, but to repair which labour is lacking, the Department will be glad to have the information in order that it may assist.

As regards harness, the Department to be informed of the desired approximate quantity of plough and thill harness which is locally procurable for any additional horses which may be sent to the county, and, with regard to second-hand harness, the Committee is requested to furnish suggestions as to the best method of putting it in repair.

It is considered essential that all purchases of implements and harness from manufacturers, as distinct from local agents, should be made by the Department, and that Committees should be careful to avoid purchasing or drawing upon supplies in the hands of dealers in other counties; otherwise competition and friction would result and would impede the equitable distribution throughout the country of the limited supplies available.

All purchases authorised under this procedure must be made in the name of the Department, and the accounts transmitted to 72, Victoria Street for payment.

Supplies and Prices of Basic Slag for the Season, 1917–18.

THE following Notice, dated 1st August, 1917, has been issued by the Food Production Department :—

Supplies.—The production of basic slag at the present time is being affected by the production of steel for munition purposes. The iron which is being used contains on the average a smaller percentage of phosphorus with the result that the slags which are now available for grinding have a lower phosphatic content. The supply of high-grade slag is therefore much less than was formerly the case.

All the suitable slag available is being ground, and the total tonnage is fully equal to what it was before the War. As no export is now allowed, the quantity available for home consumption is in fact much larger, though it is still below the demand.

In addition to the grades enumerated below, arrangements are being made in certain cases to grind a low-grade slag, which has not hitherto been used as a manure. It can be economically used on land within a moderate distance of the works.

In order that the available supplies of high-grade slag may be equitably distributed, makers who have only limited quantities of high-grade slag for sale are being advised to restrict their sales to any one buyer to approximately three-fourths of their sales of the same quality last year, and to ask buyers to take the balance of their order in a lower grade.

Farmers should not send orders to the works or firms mentioned below, but should obtain their supplies from the manure merchants, dealers, or co-operative societies from whom they usually purchase. They are recommended to place their orders at once, and to take the earliest possible delivery.

Prices.—The Food Production Department, in conjunction with the Ministry of Munitions, has come to an arrangement with makers

in regard to the maximum prices to be charged by them. Inquiries have also been made as to the usual commission charged by dealers, and the prices given below indicate the rate at which farmers should be able to purchase basic slag excluding cost of delivery from the works to the farmers' nearest railway station. As dealers usually quote basic slag at a delivered price, the farmer is recommended, when purchasing, to ascertain the cost of delivery (*i.e.* haulage, sheeting, and any other charges) from the works to his nearest station, and after adding it to the price stated below to compare the resulting figure with the price asked by the dealer.

This Notice is only intended as a guide to farmers in making future purchases. It is not contemplated that contracts already made should be cancelled.

The divergencies which exist in some cases between the prices of nominally similar grades are understood to be due either to slight variations in the qualities produced by different works, or occasionally to the situation of the works.

Prices per ton including dealer's commission for lots of not less than 4 tons, free on rail at works, in maker's single 2-cwt. bags, net cash.

Anglo-Continental Guano Works (London) :—
Citric Soluble—18 per cent., 55*s.*; 20 per cent., 60*s.*

British Basic Slag (Alberts' Successors), Limited. Works at Hawarden Bridge, Cradley, Brymbo, Etruria, Frodingham, South Bank, Park Gate, Wednesbury, Hollinswood and Middlesbrough :—
Citric Soluble—16 per cent., 44*s.*; 17 per cent., 45*s.* 6*d.*; 18 per cent., 47*s.*; 19 per cent., 48*s.* 6*d.*; 20 per cent., 50*s.*; 21 per cent., 51*s.* 6*d.*; 22 per cent., 53*s.*; 23 per cent., 54*s.* 6*d.*; 24 per cent., 56*s.*; 26 per cent., 59*s.*; 28 per cent., 62*s.* 6*d.*; 30 per cent., 66*s.* 6*d.*; 32 per cent., 68*s.* 6*d.*; 33 per cent., 70*s.* 6*d.*; 34 per cent., 72*s.*

Cwmfelin Steel and Tinplate Company (Swansea) :—
Citric Soluble—20 per cent., 52*s.* 6*d.*; 22 per cent., 54*s.* 6*d.*

The Baltic Basic Slag Company (Irlam, Manchester) :—
Total Phosphates—24 per cent., 54*s.*; 26 per cent., 56*s.* 6*d.*; 28 per cent., 58*s.* 6*d.*

Alexander Cross and Sons (South Bank, Middlesbrough and Scunthorpe, Lincolnshire) :—
Total Phosphates—17–20 per cent., 46*s.*; 20 per cent., 48*s.*; 22 per cent., 50*s.*; 24 per cent., 53*s.* 6*d.*

Alfred Hickman, Limited (Bilston, Staffordshire) :—
Total Phosphates—30 per cent., 62*s.* 6*d.*; 42 per cent., 80*s.*

The Leeds Phosphate Works, Limited (Hunslet, Leeds) :—
Total Phosphates—30 per cent., 62*s.* 6*d.*; 32 per cent., 66*s.*; 39 per cent., 74*s.*; 42 per cent., 80*s.*

South Wales Basic Slag Company, Limited (Pontardawe, Port Talbot and Panteg) :—
Total Phosphates—22 per cent., 50*s.*

Wigan Slag Phosphate Company (Middlesbrough and Wigan) :—
Total Phosphates—24 per cent., 56*s.*; 26 per cent., 58*s.*; 28 per cent., 60*s.*; 30 per cent., 62*s.*

It is to be understood that the cost of delivery from the works to the farmer's station must be added to the above prices in order to ascertain the delivered price. The prices given do not apply to transactions in which credit is given.

Prices for Smaller Quantities purchased ex *Merchant's Stores*.—In the case of purchases made from the merchant's store the farmer should expect to pay the following additions to the above prices plus transport charges to cover storage and other charges :—

For lots of 4 tons and over, 5*s*. per ton.
,, ,, 1 ton, but less than 4 tons, 10*s*. per ton.
,, ,, 2 cwt., ,, ,, 1 ton, 1*s*. ,, cwt.
,, ,, 1 ,, ,, ,, 2 cwt., 2*s*. ,, ,,
,, ,, 28 lb., ,, ,, 1 ,, 3*s*. ,, ,,

AN Order, dated 7th August, 1917, has been issued by the Ministry of Munitions to the effect that :—

Blast-Furnace Dust.

1. No person shall buy, sell, deal in or dispose of any blast-furnace dust except under and in accordance with the terms of a licence issued on behalf of the Minister of Munitions by the Controller of Potash Production.

2. No person shall treat any such dust so as to extract any component part thereof except under and in accordance with the terms of a licence issued as aforesaid.

3. All persons producing or in possession of blast-furnace dust shall make returns in regard to rate of production, stocks, purchases, sales, dealings or other matters relating to blast-furnace dust in such form and at such times as may be required by the said Controller.

4. Samples of any blast-furnace dust produced by or in the possession of any person shall be furnished to the said Controller by such person in such form and quantity and at such times as the said Controller may prescribe. Such samples shall be taken in such manner as the said Controller or his authorised representative may prescribe.

5. For the purpose of this Order blast-furnace dust shall mean dust deposited or otherwise derived from the gases of any furnace used for treating ores for the production of iron or any of its alloys.

6. All applications in reference to the above Order should be made to the Controller of Potash Production, Ministry of Munitions, 117, Piccadilly, W. 1.

Farmers and Tractors.

IN view of apparent misunderstandings in some quarters it is thought desirable by Sir Arthur Lee, Director-General of Food Production, to make clear the policy of the Food Production Department with regard to agricultural tractors and other implements.

"The Cabinet having decided that a large increase must be made in the acreage under corn and potatoes for the harvest of 1918, it has been the duty of the Food Production Department, acting through the Agricultural Executive Committees to apportion the task between the different parts of the country, and to see that the best use is made of existing resources in the way of labour, horses, machinery and other requisites.

"In this connection the first object aimed at is to ensure that farmers throughout the country make the fullest use of the resources actually at their disposal or procurable in the ordinary ways, and it is in no sense the policy of the Department to relieve agriculturists of any portion of the national task which they are able to perform themselves. To accomplish the full programme, however, it is inevitable that the Department, acting through the War Agricultural Committees, will have to assume responsibility for that residue of the task which is beyond the power of the farmers to carry out unaided.

"It is for this purpose, and for this purpose alone, that the Department is obtaining, and placing at the disposal of the County Committees, a large number of tractors, horses and other requisites (with such additional labour as can be procured), and arrangements have already been made for the purchase or loan of the full quantities required, with a substantial margin for wastage and other contingencies. Owing to shipping difficulties, conflicting demands for labour, and other war troubles, considerable delays have been experienced in securing those extra resources, but these delays are being gradually overcome; and it is anticipated, with regard to tractors especially, that deliveries will greatly improve in the near future.

"This does not imply, however, nor is it desirable, that the Food Production Department will ever be in a position, by means of Government tractors, to relieve farmers of ploughing and other work which they are able, and expected, to carry out themselves. On the contrary, it is desired and anticipated that farmers and others will make every effort to equip themselves, at their own expense, with whatever additional resources they may need, in the way of tractors, implements, horses and other requisites. In this way alone can the full national task be accomplished, for, however big the Government effort may be, it can be no part of its object to relieve agriculturists of their proper responsibilities."

The Winter Oats and Rye (Restriction) Order, 1917.

AN Order, dated 14th August, 1917, has been made by the Food Controller to the effect that:—

1. Except under the authority of the Food Controller no person shall before the 1st November, 1917, use any winter-sown winter oats (hereinafter called winter oats) grown in the United Kingdom in the year 1917, or before the 1st January, 1918, use any rye so grown for any purpose other than seed.

2. So long as the restrictions imposed by Clause 1 are in force, no person shall buy or otherwise acquire any winter oats or rye unless either he being a person who ordinarily deals therein for seed purposes acquires them with a view to re-sale, or he requires them for the purpose of seed.

3. So long as the restrictions imposed by Clause 1 are in force no person shall sell or otherwise dispose of any winter oats or rye except to a person who ordinarily deals therein for seed or to a person who is reasonably believed to require them for the purpose of seed.

4. Nothing in this Order shall affect the use of any winter oats in Scotland or in Ireland or any transaction affecting winter oats taking place in Scotland or Ireland.

AN Order, dated 31st July, 1917, has been made by the Food Controller to the effect that :—

The Milk (Returns) Order, 1917.

All persons engaged in the production, purchase, sale, distribution, transport, or storage of any milk, shall furnish particulars as to their businesses as may from time to time be specified by or on behalf of the Food Controller and shall verify the same in such manner as he may direct.

AN Order, dated 28th July, 1917, has been made by the Food Controller to the effect that :—

The Cattle and Meat (Returns) Order, 1917.

1. All persons engaged in the production, purchase, sale, distribution, transport, storage or shipment of any cattle or any meat, shall furnish such particulars as to their businesses as may from time to time be specified by or on behalf of the Food Controller and shall verify the same in such manner as he may direct.

2. For the purpose of this Order, the expression "cattle" shall include, in addition to cattle usually so called, ram, ewe, wether, lamb, deer, goats and swine; and the expression "meat" shall mean any meat obtained from cattle as defined.

AN Order dated July 28th, 1917, has been made by the Food Controller to the effect that :—

The Winter Beans Order, 1917.

1. A person shall not before the 1st December, 1917, use any winter sown winter beans grown in the United Kingdom in the year 1917 (hereinafter called winter beans) for any purpose other than seed.

2. A person shall not before the 1st December, 1917, buy or otherwise acquire any winter beans unless either he, being a person who ordinarily deals in winter beans for seed purposes, acquires them with a view to re-sale for such purpose, or he requires winter beans for the purpose of seed; and unless, in either case, he gives to the person from whom he acquires the winter beans a certificate stating the purpose for which such beans are required.

3. A person shall not before the 1st December, 1917, sell or otherwise dispose of any winter beans to any person except to a person who ordinarily deals in winter beans for seed, or to a person who is reasonably believed to require such beans for the purpose of seed, and who in either case gives such a certificate as is referred to in the preceding clause.

4. Every certificate given under this Order shall contain the name and address of the person giving such certificate and shall be retained by the person to whom it is given. All such certificates shall at all times be open to the inspection of any person authorised by the Food Controller or by a Local Authority empowered to enforce this Order, or, as respects England and Wales, by the Board of Agriculture and Fisheries, or, as respects Scotland, by the Board of Agriculture for Scotland.

5. It is also stated that nothing in this Order shall affect the use of any winter beans in Ireland or any transaction taking place in Ireland.

AN Order, dated 31st July, 1917, has been made by the Food Controller to the effect that :—

The Flour Mills Order No. 2, 1917.

1. The provisions of Regulation 2GG* of the Defence of the Realm Regulations are hereby applied as from the close of business on the 11th August, 1917,

(*a*) to every flour mill in the United Kingdom, which uses any wheat in the making of flour or meal (hereinafter referred to as a flour mill), except a mill to which the Flour Mills Order, 1917,* applies; and

(*b*) to every provender and grist mill connected with any flour mill as part of the same establishment.

2. Every person having the management or control of a flour mill shall before the 7th August, 1917, forward to the Food Controller, Grosvenor House, London, W. 1, particulars of the name or names of the proprietor or proprietors and postal address of the mill, and the hourly and weekly output capacity of the mill for the production of flour.

3. From and after the 11th August, 1917, no person shall grind wheat except at a mill in respect of which the particulars required by the foregoing clause have been furnished.

4.—(i.) Every person having the control or management of a flour mill shall keep such records relating to grain received, held and used, and relating to the operations of the mill as the Food Controller may from time to time direct, and shall make such returns relating to the operations of the mill as the Food Controller may from time to time require.

(ii.) All records and documents kept in accordance with this clause shall upon any request in that behalf be produced to and open to the inspection of any person authorised by the Food Controller.

AN Order, dated 17th July, 1917, has been issued by the Army Council to the effect that :—

Prohibition of the Lifting of Hay and Straw in Great Britain and Ireland and the Isle of Man.

1. The Army Council hereby give notice that all hay or oat or wheat straw now standing in bulk in Great Britain and Ireland and the Isle of Man, or as and when harvested is taken possession of by the Army Council and shall from the date of this Order, or as and when harvested, be held at the disposal of the duly authorised Officers of the War Department; excepting such hay or straw of the 1916 or earlier crop as has been released by Sale Licence. The Army Council Orders of the 30th June, 1916,† and the 14th September, 1916,‡ relative to the prohibition of the lifting of hay and straw in England, Wales and Ireland, in Great Britain, in Scotland, and in the Isle of Man respectively are hereby cancelled.

2. Applications to enable hay or wheat or oat straw to be sold to private consumers or dealers will only be granted in respect of qualities and quantities of hay or straw in respect of which a Sale Licence has been issued being found not to be required for Army use, and that part of the Army Council Order of 9th May, 1917,§ prohibiting the use of

* See *Journal*, May, 1917, pp. 236. † See *Journal*, Aug., 1916, p. 511.
‡ See *Journal*, Oct., 1916, p. 705. § See *Journal*, June, 1917, p. 364.

straw for certain purposes, in so far as it relates to wheat straw in Great Britain, and in so far as it relates to oat straw in Scotland, is cancelled.

3. Farmers and stock breeders are authorised to use a reasonable quantity of hay or oat or wheat straw in their possession for consumption by stock in their possession or control.

4. Applications for sale under this Order must be made in writing to the District Purchasing Officer of the district or county in which the hay or straw affected is standing.

5. Applications to purchase for the purpose of re-sale will be made in England and Wales and the Isle of Man to the Administrative Member, Forage Committee, 64, Whitehall Court, London, S.W. 1; in Ireland to the Area Administrative Officer, Royal Hospital, Dublin; and in Scotland to the Area Administrative Officer, Carlton Hotel, Edinburgh.

6. All Licences or Authorities issued under this Order will be issued subject to the restrictions and conditions contained in such Licences or Authorities; any departure from these conditions or other act in contravention of the provisions of this Order will be an offence under the Defence of the Realm Regulations, and render the offender liable to the penalties attaching thereto.

7. Detailed instructions regarding the necessary procedure to be adopted by all desiring to sell, purchase or remove hay or straw under this Order can be obtained on application to the Secretary, Forage Committee, 64, Whitehall Court, London, S.W. 1; in Ireland to the Area Administrative Officer, Royal Hospital, Dublin; in Scotland to the Area Administrative Officer, Carlton Hotel, Edinburgh; and in the Isle of Man to the D.P.O.S., Edinburgh House, Loch Promenade, Douglas.

Regulations of the Sale of Hay and Oat and Wheat Straw, and of Chopped Hay and Oat and Wheat Straw in Great Britain, Ireland and the Isle of Man.

AN Order, dated 17th July, 1917, has been issued by the Army Council to the effect that:—

That on any sale of hay, oat straw or wheat straw, or chopped hay, oat straw or wheat straw in Great Britain and Ireland and the Isle of Man, the price shall not exceed such prices as are set out in the Schedules hereunder:—

SCHEDULE I.

(LONG HAY AND STRAW.)

Maximum Prices per Ton which a Producer may not exceed.

——	Hay.	Oat Straw.	Wheat Straw.
	£ s. d.	£ s. d.	£ s. d.
To 31st December, 1917 ..	5 10 0	3 0 0	2 10 0
,, 31st January, 1918 ..	5 12 9	3 1 6	2 11 3
,, 28th February, 1918 ..	5 15 6	3 3 0	2 12 6
,, 31st March, 1918	5 18 3	3 4 6	2 13 9
After 31st March, 1918 ..	6 1 0	3 6 0	2 15 0

The above prices are deemed to include the cost of carting to nearest railway station or a distance equivalent thereto, but not the cost of cutting, trussing and tying, or baling.

SCHEDULE II.

(LONG HAY AND STRAW.)

Maximum Prices per Ton for quantities exceeding 10 cwt. which a Seller may not exceed.

——	Hay.	Oat Straw.	Wheat Straw.
	£ s. d.	£ s. d.	£ s. d.
To 31st December, 1917 ..	7 10 0	5 0 0	4 10 0
,, 31st January, 1918 ..	7 12 9	5 1 6	4 11 3
,, 28th February, 1918 ..	7 15 6	5 3 0	4 12 6
,, 31st March, 1918	7 18 3	5 4 6	4 13 9
After 31st March, 1918 ..	8 1 0	5 6 0	4 15 0

The above prices are deemed to include commission and all costs and charges incurred, of whatever nature, for hay and straw delivered on to the consumer's or purchaser's premises.

SCHEDULE III.

(LONG HAY AND STRAW.)

Maximum Prices per Stone of 14 lb. for quantities of 10 cwt. or less, which a Seller may not exceed.

——	Hay.	Oat Straw.	Wheat Straw.
	s. d.	d.	d.
To 31st December, 1917 ..	1 0	$8\frac{1}{2}$	$7\frac{1}{2}$
,, 31st January, 1918 ..	1 1	9	8
,, 28th February, 1918 ..	1 1	9	8
,, 31st March, 1918	1 2	$9\frac{1}{2}$	$8\frac{1}{2}$
After 31st March, 1918 ..	1 2	$9\frac{1}{2}$	$8\frac{1}{2}$

The above prices are deemed to include commission and all costs and charges incurred, of whatever nature, for hay and straw delivered on to the consumer's or purchaser's premises.

SCHEDULE IV.

(CHOPPED HAY AND STRAW.)

Maximum Prices per Ton for quantities exceeding 10 cwt. which a Seller may not exceed.

——	Chopped Hay mixed with 20 per cent. of Chopped Straw.	Chopped Oat Straw.	Chopped Wheat Straw.
	£ s. d.	£ s. d.	£ s. d.
To 31st December, 1917 ..	7 10 0	5 0 0	4 10 0
,, 31st January, 1918 ..	7 12 9	5 1 6	4 11 3
,, 28th February, 1918 ..	7 15 6	5 3 0	4 12 6
,, 31st March, 1918	7 18 3	5 4 6	4 13 9
After 31st March, 1918 ..	8 1 0	5 6 0	4 15 0

The above prices are deemed to include commission and all costs and charges incurred, of whatever nature, for "chop" delivered on to the consumer's or purchaser's premises, excepting that where it is delivered in returnable sacks or bags a sum equal to *7s. 6d.* per ton may be added to the above prices.

SCHEDULE V.

(CHOPPED HAY AND STRAW.)

Maximum Prices per Stone for quantities of 10 cwt. or less which a Seller may not exceed.

——	Chopped Hay mixed with 20 per cent. of Chopped Straw.	Chopped Oat Straw.	Chopped Wheat Straw.
	s. d.	*d.*	*d.*
To 31st December, 1917 ..	1 0	8½	7½
,, 31st January, 1918 ..	1 1	9	8
,, 28th February, 1918 ..	1 1	9	8
,, 31st March, 1918	1 2	9½	8½
After 31st March, 1918 ..	1 2	9½	8½

The above prices are deemed to include commission and all costs and charges, of what evernature, for "chop" delivered on to the consumer's or purchaser's premises, excepting that where it is delivered in returnable sacks or bags an additional ½*d.* per stone may be added to the above prices.

The Army Council Orders of the 5th November, 1916,* the 27th February, 1917,† and the 14th March, 1917,‡ regulating the price of hay and straw and "chopped" hay and straw are hereby cancelled.

Nothing in this Order shall affect the Army Council Order of the 9th May, 1916,§ regulating the sale, etc., of chopped hay and straw, and the prohibition of the use of oat straw for certain purposes in England and Wales.‖

The Flax Seed (Ireland) Order, 1917.

AN Order, dated 12th July, 1917, was issued by the Army Council to the effect that :—

1. It shall be the duty of every grower of flax in Ireland during the season of 1917 :

(1) To dry, with the object of saving the seed therefrom, in such manner as may be prescribed by the Department of Agriculture and Technical Instruction for Ireland, one-eighth of the total crop grown by him, such portion of one-eighth to be selected so as to represent the fair average of the crop.

(2) To stack such portion of the crop in the manner prescribed by the said Department.

(3) To de-seed same at such time and in such manner as may be prescribed by the said Department, and to comply with any directions given by the said Department in that behalf, and as to the subsequent disposal of the seed so removed.

* See *Journal*, December, 1917, p. 902. † See *Journal*, March, 1917, p. 1294
‡ See *Journal*, April, 1917, p. 110. § See *Journal*, June, 1917, p. 364.
‖ See also preceding Order, par. 2.

Provided, that if the entire crop is, with the approval of the said Department, sold on foot or in a dried condition, and the grower thereof has obtained from the purchaser an undertaking on the form set out in Schedule A hereto annexed,* the grower shall be relieved of all duty with regard to the stacking or de-seeding of the flax so sold, and such duty shall devolve on the purchaser giving the aforesaid undertaking.

2. Except as hereinbefore provided, no person shall, without a permit issued by the said Department, sell, offer for sale, purchase, make payment for or take delivery, whether for scutching or otherwise, of any flax grown in Ireland during the season 1917, unless and until he has made or obtained, as the case may be, a declaration in the form set out in Schedule B* hereto annexed.

3. No person shall sell or dispose of the seed removed from the said portion of one-eighth of the crop otherwise than to persons duly authorised by the said Department, and it shall be the duty of all such persons to comply strictly with any directions that may be given by the Department with regard to the acquisition, removal or handling of or payment for such seed.

Horses (Prohibition of Exportation from Ireland) Order, 1917.

THE Department of Agriculture and Technical Instruction for Ireland have issued an Order, dated the 14th July, providing that, on and after the 21st July, 1917, no horse shall be exported from Ireland, or be caused or permitted by its owner, or his agent, or by the person in charge of the horse, or by the owner or the master of any vessel, to be so exported, or to be placed on board a vessel for the purpose of exportation.

This prohibition, however, is not to apply to :—

(*a*) Any horse shipped under military authorisation, whether attached to a military unit or otherwise ; or

(*b*) Any horse the exportation of which is authorised by a licence granted by the Department of Agriculture and Technical Instruction for Ireland, or by an officer authorised in that behalf by the Department, provided that the terms of such licence are duly complied with.

Sale of Horses Order, 1917.

THE following Circular Letter, dated 20th July, 1917, has been addressed by the Food Production Department of the Board to the County Agricultural Executive Committees and County Borough Councils in England and Wales and the London County Council :—

SIR,—With reference to the Circular Letter (No. F.P. 75),† the Board have had under consideration the various representations which have been received in connection with the Sale of Horses Order.

The urgent need of agricultural horses for land cultivation will not admit of the withdrawal of the Order, but I desire to point out that the Order is intended to apply only to agricultural horses suitable for the purpose of cultivating the land, and that discretionary power is vested in the Agricultural Executive Committees with regard to the issue of licences in exceptional cases such as stallions, brood mares and valuable fillies under three years old which are registered in the Stud Book.

* Not here printed. † See *Journal*, July, 1917, p. 471.

No licence is considered to be necessary for ponies and cobs.

It is not essential that the name of the purchaser should be inserted in the licence at the time of issue, as this can be done after the purchase is completed in accordance with any conditions under which the licence is granted.

The Board are proposing to purchase immediately a large number of horses in connection with the scheme for increased cultivation for the 1918 harvest, so that farmers should find no difficulty in disposing of any surplus horses.

I am, etc.,
ARTHUR LEE,
Director-General.

Cartridges and Shot.*

THE following Memorandum, dated 23rd July, 1917, has been sent by the Food Production Department of the Board to Agricultural Executive Committees in England and Wales :—

Representations have been made that the restrictions on the sale of shot-gun ammunition will have a detrimental effect on the supply of food and on the preservation of crops. It has been urged that in most parts of the country it has been an exceptionally good breeding season, and that if no facilities are allowed for shooting game a substantial supply of food will be lost and considerable damage may be done to the crops in the autumn. It has also been found that Committees are finding great difficulty in arriving at any satisfactory basis on which licences to purchase cartridges should be issued.

The matter has therefore been reconsidered by the Army Council, the Boards of Agriculture for England and Scotland, the Ministry of Food, and the Ministry of Munitions, and it has been decided that the Army Council Instruction No. 945 of 1917 shall be withdrawn, so that in future no licence will be required for the purchase of cartridges by farmers or others.

Agricultural Executive Committees are therefore relieved from the duty of dealing with applications for licences, and applicants should be informed that the restrictions are being withdrawn.

It must be understood, however, that owing to the shortage of lead the Ministry of Munitions cannot undertake to supply material for the manufacture of any more cartridges, and consequently users and retailers should be urged to exercise all possible care and economy in the disposal of the existing stocks.

The Grouse and Black Game (England and Wales) Order, 1917.

AN Order, dated 3rd August, 1917, has been made by the Board of Agriculture and Fisheries authorising the killing and taking, the sale and purchase, and the possession of grouse and black game in England or Wales, at any time between 6th August (including that day) and the date at which any of these things would become lawful in the current year if this Order had not been made, by any person who would be entitled to do any of these things after the last-mentioned date.

* See also *Journal*, May 1917, pp. 252, 253.

The Killing of Certain Migratory Wild Birds.

THE Board of Agriculture and Fisheries have made an Order, dated 31st July, 1917, authorising in England and Wales the killing, on and from 1st August until the next close season, of certain migratory wild birds, with a view to increasing the food supply of the country. The birds to which the Order applies are: curlew, knot, whimbrel, golden plover, red shank, godwit, snipe, woodcock, teal, widgeon, mallard, shoveler, pochard, pin-tail, brent goose, barnacle goose, pink-footed goose, white-fronted goose, and grey lag goose. The Order does not authorise persons to kill such birds in contravention of their tenancy agreements, or on land or water on which they are not entitled to kill the birds; nor does it exempt any person from the provisions of the Gun Licence Act, 1870.

The Hop Crop of 1917.

THE following Notice, dated 2nd August, 1917, has been issued by the Board of Agriculture and Fisheries:—

A scheme has now been approved by the Government by which the crop of hops grown in 1917 will be taken over by a Committee of Management acting under the Board of Agriculture. Full particulars will be published as soon as some outstanding details have been settled. The main feature of the scheme, however, is that the Managing Committee will be in a position to purchase from all growers the hops they pick this year, and to pay them immediately a price designed to cover the cost of production. The grower will have to wait for the balance of the price, *i.e.* his profit, until the hops can be realised and the expenses of management paid off. No grower will be allowed to pick more than 50 per cent. of his 1914 acreage, to which the Order in Council of 19th May* referred. These will be the main provisions. The details of management cannot be settled until after the appointment of the Managing Committee, on which the hop growers and other trade interests concerned will be properly represented.

Poultry Advisory Committee.

THE following Notice, dated 9th August, 1917, has been issued by the Board of Agriculture:—

The Poultry Advisory Committee of the Board of Agriculture is at present considering a scheme for the preservation of the best flocks in the country should a drastic reduction of the poultry stock become necessary owing to the operations of enemy submarines.

Poultrymen may be interested to know that since 8th June, when the Committee first met, resolutions on the following subjects have been submitted by the Committee to the President of the Board of Agriculture and Fisheries:—

(1) Reservation of a sufficient quantity of oats for use in poultry food, should further restrictions on the use of cereals for feeding poultry become necessary.

* See *Journal*, June, 1917, p. 371.

(2) Price of wheat screenings, tailings, and damaged grain, whether English or foreign, compared with the price of sound grain.

(3) The Board's Scheme for distributing sittings of eggs of approved strains.

(4) Establishment of an office to decide whether samples of grain submitted for examination are unfit for human consumption and may be used for poultry feeding.

(5) Reduction in the percentage of extraction in the milling of maize in order to increase the value of the by-product as food for poultry.

(6) Economic reduction of existing poultry stocks.

(7) Selling of poultry foods by weight and the adoption of the hundredweight (112 lb.) as the standard weight.

(8) Selling of poultry foods without admixture of foreign substances, such as grit.

(9) Reservation of a certain quantity of maize for poultry feeding at fixed prices both to the merchant and consumer.

(10) Fixing price of mill screenings to retailers.

(11) Importation of eggs and fowls.

(12) Continuation of scientific hatching experiments.

(13) Exemption of expert poultrymen from military service.

Railway Transport: Perishable Fruit.

IT has been brought to the notice of the Food Production Department that in certain parts of the country fruit growers have experienced serious difficulty in securing the railway facilities necessary for the prompt marketing of perishable fruit. The Department is prepared to do all in its power to assist fruit growers in obtaining the necessary facilities, and in order that the Department may give this assistance, fruit growers who are experiencing difficulties in putting their fruit on rail should communicate immediately with the Food Production Department, 72, Victoria Street, Westminster, S.W. 1.

Harvest Weather Forecasts.

THE Meteorological Office will, as in past years, but subject to certain restrictions, supply forecasts of weather by telegraph to persons desirous of receiving them, upon payment of a registration fee of 1*s*. and the cost of the telegrams, computed at 9*d*. per day. The supply of forecasts will continue until 30th September. The forecasts are drawn up each week-day at 3.30 p.m., and refer to the probable weather during the 15 hours from 6.0 a.m. to 9.0 p.m. on the next day. The addition of a "further outlook" and the issue of notifications in connection with spells of settled weather are suspended during the War.

Applications for the forecasts should be sent to the Director, Meteorological Office, South Kensington, London, S.W., with a cheque or postal order payable to the Meteorological Committee, to cover the cost of the telegrams for the period, which should not be less than 6 consecutive days, during which the forecasts are to be sent.

Food Conservation.

ALTHOUGH very little has been said publicly in the Press or elsewhere about the measures that are being taken by the Food Production Department to prevent the waste of surplus fruit and vegetables, a great deal of work in this direction has been done quietly during the past three or four months. Of course, war conditions have militated against the setting up of so complete a scheme as would have been possible had the question of food conservation been adequately attended to in peace time. However, an organisation sufficiently effective and widespread has been built up to encourage the belief that the surplus of home-grown food will this year be handled on far sounder and more economical lines in England and Wales than ever before.

A brief outline of the plans of the Food Production Department now maturing for the treatment of surplus fruit and vegetables may prove of interest to the general public.

In the first place, after a rapid but fairly exhaustive survey of the chief fruit- and vegetable-producing areas, the Department set about securing suitable premises for conversion into pulping and drying works. The process of pulping, it may be explained, consists in the reduction of fruit to its smallest possible proportions, in a moist, storable condition without the use of sugar; this pulp being capable at any time afterwards of utilisation in jam making, confectionery, etc., by the mere addition of the necessary sugar or sugar substitute. The process of drying consists in the extraction by heat of all superfluous moisture from fruit or vegetables so that they can be stored for an unlimited period, or carried to the points at which they may be required in a condition which renders their transport easy. It will be obvious that if hundreds of thousands of tons of fruit and vegetables can be treated within marked areas, say, of 25 miles each, a vast bulk of cheap and nutritious food will be reserved for winter use and a heavy burden removed from the long-distance railway traffic of the country.

In some districts the schemes of the Department, on being explained to local growers, were welcomed with enthusiasm as an important step towards the solution of a very serious problem; in others their necessity was openly doubted. For example, in one or two notable plum-producing areas, it was stated as recently as eight weeks ago that there could not conceivably be a surplus of plums this year. During the past week Covent Garden reported a glut of this fruit; and consignments were thrown back on the growers' hands in one of these areas. Immediately they appealed to the Department to accept the fruit. The officials took the matter in hand at once, and arrangements are now being made for buildings in the locality for use as pulping and drying factories. In some districts, owing to the prohibition of the importation of foreign apples, the growers to-day are asserting with equal conviction that there can be no surplusage of apples in the country this year. Doubtless this is true so far as concerns the winter-keeping varieties; but there seems every likelihood that in more than one neighbourhood the Department's pulping factories will be called upon to deal with a surplus over immediate market requirements (at a fair price) of apples of varieties that do not keep satisfactorily.

The Branch of the Food Production Department dealing with this matter intends to establish at least one pulping or drying or pulping and drying plant in each of the chief producing districts, and the preliminary arrangements have been made in every county where surpluses are likely to occur. In many of the counties the works are already in

existence; at Cheltenham, among other places, they are actually pulping surplus fruit. The supplies handled, it should be clearly understood, are additional to those covered by the scheme of controlled jam, making establishments working under the ægis of the Contracts Department of the War Office; indeed, special attention has been paid to the avoidance of overlapping, as well as to a proper economy in the details of the plans, which are being carried out by practical men skilled in market methods and food conservation.

To deal immediately with the pulping of plums, centres are already in existence or will be opened by the end of the month at Cambridge, at Bewdley and Pershore in Worcester, at Cheltenham in Gloucestershire, at the Harper Adams Agricultural College in Shropshire, at Maidstone, Sittingbourne, and Marden in Kent, and at Chester. It may be worth mentioning that the services of the agricultural and horticultural college authorities all over the country are being utilised advantageo usly. For instance, the drying scheme in Kent will be attended to from Wye College, whose experts have a close personal knowledge of the county. Farmers' co-operative societies and market-growers' associations are also being brought into intimate touch with the scheme—notably at Cheltenham and Marden. Allotment men, smallholders, and others with little lots of surplus produce, are being asked to bulk it and send it along to be pulped or dried. For instance, at Dittisham, in Devon, the vicar and a few others are acting informally as a forwarding committee for the small local growers of plums; and other societies or groups are acting as purchasing agents in their neighbourhoods.

For the apple crop, pulping stations are being established or are contemplated at Plymouth, Totnes, Crediton, Newton Abbot, Tiverton, Bridgwater, and Wedmore, near Cheddar. Drying centres so far established include Cheltenham and Pershore, at both of which places plots have been taken and machinery is now in process of installation. At least two others stations will be opened shortly in Worcestershire, and plans are in existence for covering a large number of other counties —practically every county where intensive cultivation is practised. The Department has also interested a number of large private firms in the twin industries of pulping and drying; and several of them are already dealing with fruit and vegetables at their existing factories as well as building other factories for an enlarged output.

Apart from these special activities on the large scale the Food Production Department is suggesting more or less successfully to local allotment and smallholding societies that they should follow the lead of the Norwich Food Production League, the Criccieth Women's Institute, and smaller societies, and dispose by local marketing of such tiny surpluses as may not(even when bulked) warrant their putting on rail or motor for transport to a pulping or drying centre. Through the agency of the co-operative agricultural movement and in other ways many small village growers are being placed in touch with markets in the form of individual buyers or societies in the nearest town. Home canners, cans and bottles, are being supplied through the Department for the use of individuals, or groups of individuals, who may prefer to preserve their own fruit or vegetables; demonstrations are being given all over the country in sugarless jam making, bottling, canning, and the oven-drying of fruit and vegetables. Free leaflets on all these subjects, as well as on the storage of vegetables for winter use, are being distributed systematically; and many lectures are delivered daily up and down the country on the same subjects.

MISCELLANEOUS NOTES.

Notes on Crop Prospects Abroad.

The *International Crop Report and Agricultural Statistics* for July, 1917, published by the International Institute of Agriculture, gives the following estimates of the condition of the cereal crops in the Northern Hemisphere, 100 being taken to represent the average yield during the last 10 years. *Wheat.*—Denmark 80, Spain 100, England and Wales 94, Scotland 95, Ireland 95, Sweden 89, Switzerland 100, Canada 95. *Rye*—Denmark 65, Spain 100, Ireland 100, Sweden 75, Switzerland 98, Canada 94. *Barley*—Denmark 80, England and Wales 98, Scotland 105, Ireland 100, Sweden 94, Spain 100, Switzerland 100, Canada 98. *Oats*—Denmark 88, Spain 100, England and Wales 93, Scotland 100, Ireland 95, Sweden 94, Switzerland 95, Canada 95.

Canada.—According to reports dated 13th and 20th July, received from the Census and Statistics Office at Ottawa, the total area sown with wheat this season is 13,450,250 acres, compared with 14,897,000 acres last year; being nearly 10 per cent. less than that sown, but about 4 per cent. more than that harvested in 1916. Of the total area under wheat 809,250 acres were sown last autumn and 12,641,000 acres in the spring. The area sown with oats is 11,000,806 acres, compared with 11,376,346 acres last year; barley, 1,819,900 acres compared with 1,827,780; rye, 153,900 acres compared with 147,170; whilst hay and clover is put at 7,661,800 acres against 7,892,932 acres in 1916. Every province shows an increase in the area planted with potatoes, and it is estimated that there are 502,400 acres under this crop.

United States.—The Crop Reporting Board of the Department of Agriculture states in a report, dated the 8th August, that the preliminary returns now indicate a yield of winter wheat of about 15·1 bush. per acre, or a total of 417,000,000 bush. compared with 13·6 bush. and 482,000,000 bush., respectively, the final estimate of last year's crop; spring wheat 12·5 bush., and 236,000,000 bush compared with 8·8 bush. and 158,142,000 bush.; barley 21·8 bush. and 203,000,000 bush. compared with 24·4 bush. and 181,000,000 bush.; oats 33·6 bush. and 1,456,000,000 bush. compared with 30·1 bush. and 1,252,000,000 bush.; maize 26·3 bush. and 3,191,000,000 bush. compared with 24·4 bush. and 2,583,000,000 bush. last year. The yield of potatoes is estimated at 467,000,000 bush., against 285,000,000 bush. raised last year. The yield of hay is estimated at 100,000,000 tons. (*Broomhall's Corn Trade News, 9th August.*)

Holland.—A report received from His Majesty's Consul-General at Rotterdam on the condition of crops on 19th June states the weather during May and the first half of June was warm and dry and winter cereals has improved. The hay crop will be short, having suffered from the drought. The general condition of winter wheat is slightly better than normal, winter barley moderate to fairly good; winter rye, summer wheat, summer barley and oats varying between fairly good and good. A good yield of potatoes is expected.

Denmark.—His Majesty's Minister at Copenhagen reported on 24th June that the prospects at present are that wheat, barley, oats, rye and potatoes will be below average, while the hay crop is generally bad; but favourable weather might bring about a great change before harvest.

India.—A cable received from Karachi on the 30th July, gives the final estimate for the wheat crop in the North-West Frontier Provinces. The area sown amounted to 1,050,000 acres, and the yield to 277,000 tons (1,293,000 qr.) against the previous estimate of 239,000 tons (1,115,000 qr.) or an increase of 178,000 qr. (*London Grain, Seed and Oil Reporter*, 30th July.)

Russia.—His Majesty's Commercial Attaché at Petrograd states that according to official reports published in the Trade Gazette of 10th June, 25th June, and 8th July, the probable area under beet this season is estimated at 1,099,912 acres as compared with 1,497,371 acres last year, a decrease of 26·5 per cent. The condition of winter and spring grain crops in European Russia is generally satisfactory, though not uniformly so.

Agricultural Conditions in England and Wales on 1st August.

THE Crop Reporters of the Board, in reporting on agricultural conditions in England and Wales on the 1st August, state that the weather during July was mostly warm and dry until the end of the month, when rain set in, and that the conditions were generally favourable to the crops on the whole, especially in the west.

Wheat shows some improvement during the month; it is considerably better in the west than in the east of the country, prospects varying from about average in the counties bordering on the Severn to nearly 10 per cent. below in Lincoln and Norfolk. Barley is quite the best of the corn crops, but promises to be over average only in the west and north. Oats are a variable but poor crop, prospects being much worse in the eastern corn-growing districts, but quite average or even over in Wales and the north-west. The two latter crops, more particularly, have been a good deal knocked about by the storms at the end of the month. Beans appear to be the worst crop of the year, especially in the east; peas are better, but not up to the average.

Potatoes are everywhere very promising; no district anticipates a yield below average, and in many areas in the south they are expected to yield 10 per cent. above the mean. There is a certain amount of disease in the south-west, but in the rest of the country very little is reported.

Roots are healthy and promising. All through the dry period of the month fly was very troublesome; many fields had to be resown, and a good deal of difficulty was experienced in getting a plant. The rain towards the end came in time to effect a material improvement. Mangolds were suited by the weather, and a further advance may be noted in their prospects, which are everywhere above average, except in the extreme north.

Hops are generally reported to have done well, and the yield will, it is hoped, be a little above average, although not quite to the extent that was anticipated a month ago. Very little mould or insect attacks were reported until towards the end of the month, and less washing than usual has in most areas been necessary.

The hay was generally secured in very good condition during the fine weather, although in several districts hay-making was protracted owing to interruptions by rain, and some late hay is not satisfactory. The quantity is below average and less than was anticipated a month ago. In many parts of the west and north it is up to the average, or even over, but over most of the country, especially the east, it is very short. The yield of hay from clovers and rotation grasses is not so far short of the average as that from meadows.

Of small fruit, strawberries have yielded nearly an average crop, but gooseberries, raspberries and currants have all given very good yields. From Kent it is reported that the trees have recovered somewhat from the attacks of caterpillars, which have done a good deal of damage in many places. In spite of this, however, all orchard fruit is expected, in England as a whole, to be above the average, pears being particularly abundant.

Pastures were, in many districts, burnt up by the drought, and in such areas live stock only did moderately well. Other parts of the country, however, had sufficient rain, and pastures and live stock accordingly did better. The rain at the end of the month was everywhere very beneficial.

Labour is still very deficient, but soldiers and women were largely employed throughout the country, and farmers generally managed to get the urgent work done. In many districts also the fine weather shortened the hay-making.

Summarising the returns, and expressing an average crop by 100, the appearance of the crops on the 1st August indicated probable yields per acre which may be denoted by the following percentages: Wheat, 95; barley, 99; oats, 93; beans, 85; peas, 94; potatoes, 105; mangolds, 102; seeds hay, 96; meadow hay, 91; and hops, 101.

Agricultural Labour in England and Wales during July.

The following local summaries give further details regarding agricultural labour in the different districts of England and Wales:—

Northumberland, Durham, Cumberland, and Westmorland.—Labour is still scarce in this neighbourhood, but with the help of soldiers and women the shortage has been minimised. The excellent weather has greatly helped the farmers, as the hay required very little working, with a resultant saving in casual labour.

Lancashire and Cheshire.—Labour is generally deficient, but the favourable weather for the hay harvest has counteracted the shortage, and with temporary assistance the work has been met.

Yorkshire.—The supply of labour is still short, but women and soldiers are greatly helping farmers, whilst the good haymaking weather rendered less labour necessary in the hay fields.

Shropshire and Stafford.—Labour is still scarce, but great assistance has been received from soldiers and women.

Derby, Nottingham, Leicester, and Rutland.—Labour is still deficient, but with the assistance received from soldiers and women the farmers are getting along fairly well.

Lincoln and Norfolk.—Labour is still short, notwithstanding the assistance given by women and soldiers. Good hay-making weather mitigated this shortage to a certain extent.

Suffolk, Cambridge, and Huntingdon.—Labour is still very deficient, but the assistance given by women and soldiers has helped to relieve the situation in many places.

Bedford, Northampton, and Warwick.—Labour still remains scarce, although wages are high. Women and soldiers have been helping in most districts. The good hay-making weather caused a great saving in casual labour.

Buckingham, Oxford, and Berkshire.—Labour is generally deficient and little hoeing has been done, but women and soldiers have greatly assisted during the hay harvest.

Worcester, Hereford, and Gloucester.—The supply of labour is short, but assistance in the hay harvest has been given by soldiers, and women and boys have also proved useful.

Cornwall, Devon, and Somerset.—Labour is everywhere short, but assistance has been given by soldiers and women.

Dorset, Wiltshire, and Hampshire.—Labour is generally short, but with the assistance of soldiers, women and boys, farmers have managed to meet the urgent work.

Surrey, Kent, and Sussex.—The supply of labour is generally short, but farmers have been able to cope with the urgent work with the assistance of soldiers and women.

Essex, Hertford, and Middlesex.—The supply of labour has been short, but with the assistance of soldiers and women the farmers have been able to get through the work.

North Wales.—Labour is still deficient, but owing to the men working overtime, and with asstisance received from soldiers, women and children, the work is well in hand.

Mid Wales.—Labour is scarce, especially casual workers, but good hay-making weather helped farmers over this difficulty.

South Wales.—Labour is still deficient, though soldiers and women have been employed.

Prevalence of Animal Diseases on the Continent.

THE following statement shows that according to the information in the possession of the Board on 1st August, 1917, certain diseases of animals existed in the countries specified :—

Austria (*on the 30th May.*)—Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Denmark (*month of May*).—Anthrax, Foot-and-Mouth Disease, Swine Erysipelas, Swine Fever.

France (*for the period 17th June—7th July*).—Anthrax, Blackleg, Foot-and-Mouth Disease, Glanders and Farcy, Rabies, Sheep-scab, Swine Erysipelas, Swine Fever.

Germany (*for the period 15th—31st May*).—Foot-and-Mouth Disease, Glanders and Farcy, Pleuro-pneumonia, Swine Fever.

Holland (*month of June*).—Anthrax, Foot-and-Mouth Disease, Foot-rot, Glanders, Swine Erysipelas.

Hungary (*on the 30th May*).—Foot-and-Mouth Disease, Glanders and Farcy, Sheep-pox, Swine Erysipelas, Swine Fever.

Italy (*for the period 2nd—8th July*).—Anthrax, Black-leg, Foot-and-Mouth Disease (497 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever.

Norway (*month of June*).—Anthrax, Black-leg.

Russia (*month of November*).—Anthrax, Cattle-plague, Foot-and-Mouth Disease (29,862 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine-fever, Swine Erysipelas.

Spain (*month of April*).—Anthrax, Black-leg, Dourine, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (*month of June*).—Anthrax, Black-leg, Swine Fever.

Switzerland (*for the period 9th—15th July*).—Anthrax, Black-leg, Swine Fever.

No further returns have been received in respect of the following countries : Belgium, Bulgaria, Montenegro, Rumania, Serbia.

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	JULY.		SEVEN MONTHS ENDED JULY.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	18	27	311	345
Animals attacked	21	30	357	406
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	24
Glanders (including Farcy): —				
Outbreaks...	2	5	16	32
Animals attacked	2	13	28	84
Parasitic Mange:—				
Outbreaks	144	114	1,734	1,590
Animals attacked	225	189	3,412	3,641
Sheep-Scab:—				
Outbreaks	8	1	391	178
Swine Fever:—				
Outbreaks	163	355	1,575	2,970
Swine slaughtered as diseased or exposed to infection	71	300	680	8,385

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	JULY.		SEVEN MONTHS ENDED JULY.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	—	1	3	3
Animals attacked	—	1	5	7
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—	—	1	—
Parasitic Mange:—				
Outbreaks	4	6	32	43
Sheep-Scab:—				
Outbreaks	6	22	239	248
Swine Fever:				
Outbreaks	15	35	156	194
Swine slaughtered as diseased or exposed to infection	50	231	980	1,115

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES in July and June, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	JULY.		JUNE.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle :—	s. d.	s. d.	s. d.	s. d.
Polled Scots	19 7	18 3	20 5	18 3
Herefords	18 11	17 4	19 6	17 10
Shorthorns	19 1	17 5	19 2	17 9
Devons	18 9	17 4	18 6	16 11
Welsh Runts	—	16 9	—	—
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	d.	d.	d.
Veal Calves	17	15	17¼	15¼
Sheep :—				
Downs	17½	16½	18¼	16¾
Longwools	16½	15	17	15¾
Cheviots	18	16½	19	17½
Blackfaced	17	15¾	17¾	16½
Welsh	16¼	15	16⅜	15½
Cross-breds	17¼	15¾	18¼	16½
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	s. d.	s. d.	s. d.	s. d.
Bacon Pigs	16 9	15 9	16 0	15 1
Porkers	17 3	16 4	16 7	15 9
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ s.	£ s.	£ s.	£ s.
Shorthorns—In Milk ...	44 0	34 17	44 10	35 5
,, —Calvers ...	40 19	33 5	41 8	33 5
Other Breeds—In Milk ...	40 17	33 11	43 19	33 8
,, —Calvers ...	30 0	27 0	28 10	26 10
Calves for Rearing	4 4	3 5	4 4	3 5
Store Cattle :—				
Shorthorns—Yearlings ...	16 15	14 9	17 19	15 15
,, —Two-year-olds...	26 14	22 2	26 17	23 0
,, —Three-year-olds	35 5	31 9	36 3	30 13
Herefords —Two-year-olds...	27 10	25 0	28 12	24 8
Devons— ,,	26 17	22 18	28 13	24 7
Welsh Runts— ,,	26 7	21 7	27 11	22 4
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	s. d.	s. d.	s. d.	s. d.
Downs or Longwools ...	63 0	50 0	70 9	62 4
Store Pigs :—				
8 to 12 weeks old	35 8	26 6	36 9	27 9
12 to 16 ,, ,, ...	57 3	46 3	60 11	47 11

* Estimated carcass weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND in July, 1917

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Leeds.	Liverpool.	London.	Manchester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—						
English	1st	139 6	134 0	—	135 6	132 0
	2nd	132 6	126 6	—	126 6	127 0
Cow and Bull	1st	121 6	125 6	116 6	112 0	116 6
	2nd	109 6	115 0	95 6	102 6	104 0
Irish: Port Killed	1st	—	—	127 0	130 6	126 0
	2nd	—	—	111 6	122 0	116 6
Argentine Frozen—						
Hind Quarters	1st	112 0	—	—	—	—
Fore ,, ...	1st	97 0	—	—	—	—
Argentine Chilled—						
Hind Quarters	1st	124 0	120 0	118 0	125 0	118 0
Fore ,, ...	1st	100 6	97 6	94 0	97 6	94 0
American Chilled—						
Hind Quarters	1st	126 0	123 6	—	128 6	—
Fore ,, ...	1st	98 0	95 6	—	99 6	—
VEAL :—						
British	1st	133 0	137 6	134 0	140 0	134 0
	2nd	126 0	123 6	112 0	121 6	113 0
Foreign...	1st	—	—	—	—	—
MUTTON :—						
Scotch	1st	—	147 0	146 0	157 6	143 6
	2nd	130 6	136 6	124 6	148 0	137 6
English	1st	148 0	147 0	—	153 0	137 6
	2nd	137 6	136 6	—	143 6	130 6
Irish: Port Killed	1st	143 6	—	130 6	148 0	135 6
	2nd	136 6	—	116 6	139 0	126 0
Argentine Frozen	1st	96 6	95 6	95 0	93 6	95 0
New Zealand ,, ...	1st	86 6	—	86 6	87 6	86 6
Australian ,, ...	1st	—	—	—	—	—
LAMB :—						
British	1st	150 0	151 6	147 0	161 0	153 0
	2nd	143 6	140 0	135 6	151 6	143 6
New Zealand	1st	100 6	—	98 0	98 0	98 0
Australian	1st	100 6	100 6	98 0	98 0	98 0
Argentine	1st	105 0	105 0	105 0	102 6	105 0
PORK :—						
British	1st	141 0	134 0	—	130 6	—
	2nd	134 0	121 6	—	121 6	—
Frozen	1st	103 0	103 0	—	106 6	—

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at certain MARKETS in ENGLAND in July, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
	s. d.	*s. d.*	*s. d.*	*s. d.*	*s. d.*	*s. d.*
BUTTER :—	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.	per 12 lb.
British	—	—	—	—	22 6	21 6
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery—Fresh	200 0	196 0	204 0	200 6	200 6	196 6
,, Factory	181 0	175 6	182 6	178 6	183 6	178 0
Danish	—	—	215 6	212 6	213 6	210 0
French	—	—	—	—	205 6	196 6
Dutch	—	—	—	—	192 0	182 6
Australian	194 6	190 0	—	—	195 0	191 0
New Zealand	200 0	197 6	—	—	201 0	197 0
Argentine	—	—	—	—	193 6	190 0
CHEESE :—						
British—						
Cheddar	140 0	—	—	—	139 0	—
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	147 6	143 0	146 0	—
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	130 6	—	130 6	—	130 6	—
BACON :—						
Irish (Green)	149 6	147 6	153 0	148 6	148 6	145 0
Canadian (Green sides)	128 6	126 0	133 6	127 0	133 6	130 6
HAMS :—						
York (Dried or Smoked)	—	—	—	—	185 0	177 6
Irish (Dried or Smoked)	—	—	—	—	155 6	150 6
American (Green) (long cut)	128 6	126 6	129 6	126 6	130 0	126 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	—	—	—	—	25 5	23 9
Irish	24 0	—	23 9	22 7	24 4	23 3
Danish	—	—	—	—	25 4	23 1
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Duke of York	305 0	235 0	—	—	306 6	280 0
Irish	261 6	226 6	340 0	270 0	—	—
Other First Earlies ...	301 6	215 0	341 6	270 0	270 0	246 6
HAY :—						
Clover	—	—	150 0	140 0	138 0	128 6
Meadow	—	—	—	—	137 6	128 6

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1915, 1916 and 1917.

Weeks ended (*in* 1917).	WHEAT.						BARLEY.						OATS.					
	1915.		1916.		1917.		1915.		1916.		1917.		1915.		1916.		1917.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	46	2	55	8	76	0	29	7	47	8	66	4	26	5	31	5	47	1
,, 13 ...	48	9	56	7	75	8	30	5	48	6	65	7	27	6	31	11	47	2
,, 20 ...	51	6	57	2	75	8	31	3	49	6	64	9	28	10	32	6	47	4
,, 27 ...	52	8	58	0	75	10	32	5	51	0	64	5	29	10	32	11	47	8
Feb. 3 ...	53	3	58	3	75	10	33	7	52	5	64	0	30	3	32	4	47	3
,, 10 ...	54	8	57	6	76	0	34	7	52	10	63	5	31	1	32	2	46	11
,, 17 ...	56	0	56	11	76	3	34	11	53	6	63	8	31	5	31	9	47	3
,, 24 ...	56	0	58	2	76	9	35	3	54	2	63	9	31	8	32	2	47	8
Mar. 3 ...	55	11	59	4	77	4	34	6	55	7	64	0	31	8	32	4	48	0
,, 10 ...	54	8	58	2	78	0	33	5	55	6	63	7	31	0	32	3	48	7
,, 17 ...	53	9	57	9	78	10	32	2	55	4	64	1	30	7	31	10	49	4
,, 24 ...	54	3	55	11	80	3	31	11	54	6	65	6	30	6	31	4	50	4
,, 31 ...	54	6	53	6	81	5	31	9	53	8	71	10	30	6	30	5	51	10
Apl. 7 ...	54	9	51	8	84	4	31	3	53	7	69	11	30	4	30	1	55	1
,, 14 ...	55	4	53	2	85	2	30	10	53	1	71	10	30	5	30	7	57	2
,, 21 ...	56	5	55	3	84	10	31	5	52	10	70	6	30	11	31	8	59	8
,, 28 ...	58	3	56	3	81	1	32	7	53	5	69	5	31	5	32	4	58	6
May 5 ..	60	5	55	7	77	7	33	3	53	1	64	4	32	4	32	10	54	9
,, 12 ...	61	7	55	5	78	0	34	0	53	5	64	11	32	5	33	1	55	2
,, 19 ...	62	0	55	0	77	11	34	1	52	10	64	10	32	8	33	0	55	2
,, 26 ...	61	11	54	7	78	0	34	8	52	9	64	9	32	7	33	4	54	11
June 2 ...	61	9	53	3	78	0	35	4	53	9	65	11	32	5	33	3	54	11
,, 9 ...	60	1	51	2	78	0	34	5	52	8	67	7	32	4	32	7	55	0
,, 16 ...	56	1	48	10	78	2	34	3	50	9	75	6	31	9	32	1	55	1
,, 23 ...	52	0	47	6	78	1	34	4	49	10	75	0	31	9	31	3	55	2
,, 30 ...	49	5	46	3	78	3	35	3	49	1	73	11	31	1	30	10	55	1
July 7 ...	50	1	46	3	78	1	34	7	45	6	69	5	31	6	30	8	55	2
,, 14 ...	52	7	48	11	78	2	35	8	47	5	70	10	31	6	31	6	55	1
,, 21 ...	53	10	51	6	78	3	35	10	48	8	72	1	32	1	32	3	55	2
,, 28 ...	55	3	53	5	78	3	36	1	47	2	65	7	31	1	32	5	55	2
Aug. 4 ...	55	4	55	1	78	2	35	7	46	1	73	6	31	5	32	9	55	0
,, 11 ...	55	2	56	7	78	4	37	0	46	11	76	1	31	7	31	2	55	0
,, 18 ...	54	3	58	1			39	4	48	0			31	4	30	8		
,, 25 ...	51	11	59	0			38	3	47	1			30	0	31	6		
Sept. 1 ...	45	3	59	4			38	1	48	5			26	10	30	5		
,, 8 ...	43	0	59	3			37	11	51	7			26	8	31	1		
,, 15 ...	42	9	59	11			39	0	52	6			26	4	30	9		
,, 22 ...	43	3	59	4			39	8	53	3			26	1	30	9		
,, 29 ...	43	5	58	10			40	4	54	1			26	5	31	1		
Oct. 6 ...	44	1	59	2			41	0	54	5			26	5	30	9		
,, 13 ...	45	9	59	7			42	3	53	10			27	1	31	6		
,, 20 ...	48	2	60	9			44	0	53	8			28	1	31	11		
,, 27 ...	50	3	62	10			46	2	54	6			29	1	32	10		
Nov. 3 ...	51	6	66	7			47	3	56	2			30	4	34	0		
,, 10 ...	52	8	69	8			47	5	58	0			30	11	35	8		
,, 17 ...	53	6	70	9			47	11	59	8			31	3	37	8		
,, 24 ...	54	2	70	8			48	7	61	8			31	1	39	7		
Dec. 1 ...	53	7	71	3			48	11	63	1			30	11	41	4		
,, 8 ...	52	10	72	1			47	10	65	6			30	4	44	1		
,, 15 ...	53	11	73	2			47	5	66	5			30	6	45	10		
,, 22 ...	53	10	74	8			47	2	67	3			30	7	46	5		
,, 29 ...	54	9	75	10			47	5	67	5			30	10	47	4		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of July, 1915, 1916, and 1917.

	WHEAT.			BARLEY.			OATS.		
	1915.	1916.	1917.	1915.	1916.	1917.	1915.	1916.	1917.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	54 10	50 11	79 7	36 3	48 6	65 7	32 11	33 4	54 9
Norwich ...	51 1	50 0	77 11	36 3	—	67 2	32 6	32 1	55 0
Peterborough	52 10	49 11	78 8	34 9	44 6	65 1	31 9	31 11	54 11
Lincoln ...	51 4	52 5	78 1	33 0	46 10	65 7	31 9	32 1	56 0
Doncaster ...	50 8	48 9	77 11	34 3	—	65 4	30 11	31 7	55 0
Salisbury ...	50 11	50 10	78 5	35 5	49 1	74 4	31 2	31 0	54 11

The Weather in England during July.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
Week ending 7th July :								
England, N.E. ...	53·9	—4·3	0·01	0	—13	1	8·0	+1·5
England, E.	57·0	—2·8	0·04	1	—10	1	9·3	+2·3
Midland Counties ...	56·6	—2·8	0·08	2	— 9	1	8·3	+1·8
England, S.E. ...	58·6	—1·8	0·92	24	+13	3	8·3	+0·9
England, N.W. ...	57·7	—0·5	0·00	0	—13	0	10·7	+4·3
England, S.W. ...	57·3	—1·8	0·50	13	0	3	7·3	+0·2
English Channel ...	58·6	—1·6	0·22	6	— 6	3	5·1	—3·2
Week ending 14th July :								
England, N.E. ...	57·7	—1·0	0·05	1	—15	1	6·6	+0·4
England, E.	59·7	—0·7	1·02	26	+13	3	7·6	+0·8
Midland Counties ...	59·3	—0·3	0·28	7	— 6	1	6·5	+0·6
England, S.E. ...	60·0	—1·2	0·49	12	+ 1	2	7·0	—0·2
England, N.W. ...	59·1	+0·5	0·02	1	—16	1	8·1	+1·8
England, S.W. ...	59·1	—0·3	0·41	10	— 6	2	8·1	+1·6
English Channel ...	60·9	0·0	0·26	7	— 5	2	8·8	+0·9
Week ending 21st July :								
England, N.E. ...	60·4	+1·6	0·46	11	— 4	4	6·7	+1·1
England, E.	62·4	+1·4	0·54	14	— 1	4	7·6	+0·9
Midland Counties ...	61·5	+1·2	0·87	22	+10	4	6·6	+1·0
England, S.E. ...	62·2	+0·7	0·66	17	+ 4	3	7·5	+0·7
England, N.W. ...	60·2	+1·2	0·86	22	+ 5	4	7·5	+1·9
England, S.W. ...	60·2	+0·1	0·89	23	+ 5	3	5·6	—0·5
English Channel ...	62·0	+0·7	0·65	16	+ 3	3	6·5	—0·8
Week ending 28th July :								
England, N.E. ...	64·9	+6·4	0·41	10	— 8	3	6·5	+1·4
England, E.	66·0	+5·5	0·03	1	—14	1	8·2	+2·4
Midland Counties ...	65·1	+5·4	0·27	7	—12	2	5·9	+0·7
England, S.E. ...	64·0	+2·7	0·14	4	—11	2	7·4	+1·0
England, N.W. ...	63·3	+4·5	0·62	16	— 6	4	5·4	+0·2
England, S.W. ...	62·6	+2·7	0·40	10	—11	3	4·2	—1·5
English Channel ...	64·4	+3·0	0·17	5	—10	2	7·3	+0·4

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THE BREAKING UP OF GRASS LAND.*

THE accumulated experience of British farmers is expressed in the agricultural proverb, "To break a pasture will make a man," but the public comments which have been made on the question since the Department's programme of tillage for 1918 was announced, suggest either that the experiences of our forefathers have been forgotten or that the other part of the proverb, "To make a pasture will break a man," has sapped the courage of those agriculturists who have recently endeavoured to prove that the breaking up of grass land is the food producer's short road to ruin, and that the only prudent plan is to increase production on existing arable land. That the existing arable land may be made to yield more food is admitted, and that in many cases it will yield more is expected; but in view of the urgent necessity of adding to the food supply of the country, a policy which neglected the fertility stored up in our grass lands would clearly be indefensible. We cannot rely on the chance that a favourable season and concentration of available resources on existing tillage land may enable the farmer to produce more food in 1918 than, with all the resources of peace, he produced before

* This article forms the first few pages of a "Report on the Breaking Up of Grass Land," by Mr. T. H. Middleton, C.B., Deputy-Director-General, Food Production Department of the Board. The Report is based on inquiries addressed to farmers in all parts of the country by the Cultivations Sub-Committee of the Technical Committee of this Department. Copies of the Report, which contains also very complete summaries of 142 reports on the breaking up of grass land in the different counties of England and Wales in 1916–17, may be obtained free of charge and post free on application to the Secretary, Board of Agriculture and Fisheries, 3, St. James's Square, London, S.W. 1. Letters or post-cards of application need not be stamped.—*Ed.*

the War. Again, although it is admitted that modifications in the rotation will enable much more corn to be produced on existing arable land than formerly, we cannot assume that the War will end in 1918; or that our land can retain its condition if we largely reduce the area under clover; or that we can maintain a full milk supply, support through the winter months our valuable flocks and herds, prepare the manure on which successful tillage depends, and keep our soils free from weeds, if we largely reduce the area under roots.

More arable land is necessary, and, therefore, grass land must be broken up. This policy has been approved, and the question of immediate importance is not whether grass land shall be ploughed, but how the grass which must be broken up should be dealt with.

Much useful experience has been gained by farmers who have broken up grass land during the past winter and spring, and, with the object of advising those who have the task in front of them, the Department addressed inquiries to a large number of farmers in different parts of the country.

Up to the time of writing over 300 replies have been received from 55 counties In view of the difficulties attending the work last spring, the inexperience of many of the farmers in breaking up old grass, and the unskilled labour that had often to be employed, the results secured have been very satisfactory. For every failure reported there have been four successes, and, though some of the failures cannot be accounted for, most of them are due to reasons which further experience should enable farmers to avoid.

Successes are reported in growing many kinds of crops on the newly broken grass. Oats, wheat, barley, peas, beans, potatoes, mangolds, mustard, rape, turnips, linseed, are all mentioned as having given satisfaction, and it is evident that a farmer who knows his work has a considerable choice of crops available. As little of the land reported upon had been taken in hand until after the New Year, and most of it was broken up between the middle of February and the end of April, few of the reports relate to autumn-sown crops, and in by far the larger proportion of cases spring oats was the crop grown. Black Tartarian oats have been grown frequently and white Tartarian oats have also been popular in the south. In the other cases, ordinary white oats have been grown, the varieties differing with the district.

LESSONS FROM THE SUCCESSES AND FAILURES OF 1917.

As stated in the opening paragraph, it has been argued during the past few months that it is hopeless to attempt to plough out old grass land in the expectation of adding to the nation's food. The experience of 1917 does not support this contention. It shows not only that the successes far outnumber the failures, but that the latter are to some extent preventable. Failures occurred chiefly in the south and east. They are comparatively rare elsewhere. In by far the greater number of cases they have been attributed to wireworms.

The wireworm is bad enough, but is not as vile as his reputation. Much of the damage put down to wireworms was primarily due to the drying out of the newly ploughed soil through lack of proper tillage; and in the south much damage which the wireworm was supposed to do was, in reality, caused by the frit fly. Many remedies for these insect pests have been suggested. The most satisfactory are those which depend on suitable tillage. Frit flies are most troublesome in the case of crops sown in mid-season. Oats sown before 15th March and after 15th April may escape when crops sown between these dates may be destroyed. Wireworms are most destructive in loose, open soils, partly because they can get about easily, and partly because crops, if injured, die quickly in a hollow, dry soil; while in a firm soil, even should part of the root system be cut by a wireworm, the plant soon re-establishes itself.

The Time to Plough.—Under present conditions it is not usually possible for the farmer to choose his time; he must plough whenever the weather is suitable, and although ploughing out of season may necessitate modifications in the usual tillage, good results may be expected to follow suitable handling.

There are two cases in which emphasis has been laid on ploughing at the right time.

(*a*) The first is the case of poor, heavy clay land in the drier parts of the country. Soils of this type are dense, sour and lack air. If exposed to the hot summer sun and to summer rain they crumble and form a healthy seed-bed. Land of this type should be broken in summer so that there may be at least a partial fallow. When such land is ploughed up out of season it is likely to require specially careful management.

(*b*) The second case in which timely ploughing is insisted on is that of the medium or light land of those districts most subject to wireworm attacks. It has been the experience of a number of farmers that the oat crop on late-ploughed and late-sown land has been better than on grass broken up earlier in the season. If there were a choice, it is unquestionable that there would be less trouble from wireworm on land ploughed in March than December in certain parts of the southern counties. On the other hand, crops sown in the second half of March are more subject to the attacks of frit fly than those sown earlier, and, given intelligent management, it would appear that the early-sown crop on land ploughed in autumn and winter may often be as safe as the late-sown.

As success so frequently depends on burying the turf properly, disc and skim coulters attached to the plough are most useful in breaking up grass.

Cultivation after Ploughing.—In many cases, especially in those of the medium and light soils in the north and west, the subsequent cultivation of grass land ploughed up with the ordinary ley furrow is a simple matter. If ploughed early in the season, so that the well-packed furrow slice has time to consolidate further and to weather down under frost and rain, the broadcast sower and harrow will do all that is required until in the late spring the roller prepares the surface for the harvester. But the old sod, the tractor plough, and late spring ploughing, with the object of defeating wireworm, have between them brought four implements, the disc cultivator, the disc drill, the land presser and the Cambridge roller* into much greater prominence than before.

Disc harrows or disc cultivators are frequently mentioned as valuable aids by those who have succeeded in growing good crops after grass; with their help the flat furrow left by the tractor plough has been converted into a good seed-bed, better indeed, to the surprise of some northern farmers, than that obtained from the orthodox grass furrow of the horse plough. When the furrow slice is imperfectly turned the disc harrow breaks the uneven land down, and when the furrow is turned over on its face, this harrow secures a tilth on the surface without disturbing the buried sod; an important point, as will appear from what follows.

* This old implement, now always called the Cambridge roller, was originally known as Cambridge's *Patent Press-wheel Roller*, and was designed to combine the work of the land presser and the ordinary roller.

In the case of all land ploughed out of grass in autumn, winter and spring, the efforts of the farmer must be concentrated on getting it sufficiently solid before seeding, and the thicker the turf and later the ploughing the more necessary the presser and roller become. The usefulness of the roller in checking wireworm has already been remarked on; but there is a greater enemy to the young corn crop of the south and east than wireworm, namely, drought. From the middle of April onwards the soil dries rapidly, and, if it is at all loose and contains large quantities of half-decayed turf, even a week's dry weather and hot sun in May will check the crop. On the other hand, if the turf has been well rotted, and if the soil has been compacted so that there is no break in passing into the subsoil, the young corn plant should stand dry weather quite as well on ploughed grass as on old arable land. Some farmers, who broke up land last spring and failed, have seen the reasons for failure so plainly that they are going to break more next winter and put sheep as well as rollers on the land to make it solid.

In land left hard on the surface from frequent treading, or on land where there is a tough sod, the disc drill covers the seed much more effectively than the ordinary drill, and does not tear up the sod as an ordinary coulter drill is apt to do.

Manures.—Many farmers attribute success to the use of suitable manures. It is seldom that pasture land of fair quality should require manure in order to produce a good corn crop, and as a general rule the existing supplies of manure should be conserved for our old arable land, much of which badly needs manuring.

There are, however, exceptions to the statement that grain crops on ploughed grass do not want manure. Many clay soils in the south and east were almost absolutely exhausted of available phosphates before they "tumbled down" to grass a generation ago, and the condition of the existing vegetation shows that until phosphates are supplied little wheat can be expected. In such cases a dressing of 2 to 3 cwt. per acre of superphosphate or of basic slag at sowing time should be given. Backward wheat may be assisted in the autumn or early spring by sulphate of ammonia ($\frac{3}{4}$ to 1 cwt. per acre); but it is usually too late to revive wheat which is seen to be "going off" in May. Where there is a poor, matted turf, mixed manure supplying $\frac{3}{4}$ cwt. sulphate of ammonia and 2 cwt. superphosphate is very necessary for the oat crop. On poor

pastures a dressing of sulphate of ammonia before sowing oats seems to have been markedly effective in several of the instances in which wireworm threatened the crops, but the experience of the majority of those who used it is probably summed up by the Monmouthshire farmer whose comment was: "What absolute fools the Authorities were for recommending sulphate of ammonia for corn on new land."

THE TREATMENT OF LAND OF DIFFERENT TYPES.

With the object of giving precision to the recommendations in the reports, it will now be desirable to indicate the kind of tillage called for by different types of land. As soils grade almost imperceptibly from one type to another, so the methods of management vary; but for each well-marked type of soil there are certain approved methods.

(i.) Medium and Light Soils.

Second-rate Pastures.—There is a very large area of land of this description in England and Wales. Some of it may be very old grass, with a thick, matted turf, but the greater part consists of grass land from 5 to 10 years old in the long leys of Wales and the west of England; or of pastures from 15 to 30 years old which have been allowed to lie in grass because of the low prices of corn, such as those on the chalk in Wiltshire.

Where there is a thick-matted turf, early ploughing should be resorted to, otherwise there will not be time for the sod to crumble before the first crop is sown, and this is likely to be a failure. When this coarse-matted surface layer is met with on light soils, the land should be ploughed with a flat furrow; the disc cultivator will prove useful, and a dressing of lime (1 to 2 tons per acre) will greatly aid decay. If the soil is sandy lime should be used sparingly, and ground limestone is preferable to burnt lime. The lime should be applied either several months before ploughing, or as soon as the furrow has been turned. When the turf is thin, as it usually is in the case of long leys and chalk pastures, the time and type of ploughing will depend on local conditions. The experience of Wiltshire and Hampshire favours spring ploughing; but in many other cases, especially where the soil is raw and deficient in lime, exposure to frost is most desirable, and an effort should be made to turn the furrow before the end of January. Where the farmer owns a drill a flat furrow will probably be best, as the land is then more easily consolidated; but if, as is usual in hilly districts, the oats are to be sown

broadcast, then the plough should be set to turn the ordinary ley furrow from 5 to 6 in. deep and 8 to 9 in. wide. This furrow must be thoroughly well consolidated; the later the ploughing, the thicker the turf, and the drier the district, the more necessary the use of the roller becomes. The harrow must, of course, be used as often as may be necessary, and if harrowing begins before the ploughed land has settled down, short tines or a spiked chain harrow will be desirable, in the first instance, so as to avoid bringing up the turf. When ploughing is delayed until after the end of January a flat furrow is likely to prove best, even when the crop is sown broadcast.

Good Grass on Medium or Light Land.—An inch or two of additional depth may altogether alter the character of the grass, and soils of the type discussed above may gradually shade from medium to good, or even rich, grass land within the same enclosure. Thus, in ploughing up a 20-acre field. it may frequently happen that 5 or 6 acres at the lower or more sheltered side may (partly from the natural quality of the soil, and partly because stock have favoured it) consist of very fine land in such high condition that an oat crop would lodge. This type of soil should be planted with potatoes. No farmyard manure will be necessary. A dressing of 3 to 4 cwt. superphosphate, 1 cwt. to 1¼ cwt. sulphate of ammonia and some potash manure, such as flue dust, supplying the equivalent of 2-3 cwt. kainit, will suffice. If no potash is available and the soil is light, a small dressing of farmyard manure is desirable. If the sod is very thick it must be thoroughly broken, otherwise there will be difficulty in moulding up the potato crop. To break the turf, disc harrow the surface thoroughly, then plough deeply, using a skim coulter to bury the vegetation. If no disc harrow is available, plough shallow early in winter, break up the sod with a drag harrow and plough under with a deep furrow. In the case of land which is medium in texture and inclined to be damp, it is neither necessary nor desirable to secure a fine tilth for potatoes; the sod helps to keep the soil light and open, and if the turf is not thick, ordinary deep ploughing, cultivating and harrowing will bring the field into a suitable condition for ridging up.

Good Grass on Deep, Rich Alluvial Soil.—Land of the type last considered may shade into a rich, deep loam; or, as in Lincolnshire, there may be fine silt or warp land now used for fattening cattle, but known to be so well adapted for arable farming, that under present circumstances it should be broken

up. In the coming autumn it will be necessary to sow wheat on a large part of the stubble land which, in ordinary circumstances, would be planted with potatoes, and to replace the area lost it will be necessary to grow potatoes on this rich grass land, which experience has proved to be so well suited to the crop. Deep alluvial land may best be prepared for growing potatoes by ploughing to a depth of from 10 to 12 in. This depth is secured by employing two ploughs following each other in the same furrow. One takes off the surface to a depth of 2 in. or 4 in., turning the turf into the bottom of the deep furrow left by the other plough, which opens a furrow of from 6 to 8 in. The thick turf of this rich land is thus buried at a depth at which it will rot and will not dry out the soil, and, in contrast with the medium land last referred to, the potatoes are grown in the rich loam which underlies the turf, not in a mixture of turf and loam.

(ii.) **Heavy Loams and Clay Soils.**

Second-rate Grass.—Much inferior grass land on heavy loams and clay soils exists in the Midlands and South of England. Heavy loams and clays may be managed in the way recommended for medium loams. They want earlier ploughing, because more exposure to the weather is necessary, and, if late ploughed, more cross-cultivating, ploughing or harrowing and rolling will be wanted than in the case of lighter soil; if thin in the turf they may benefit by cross ploughing in spring.

As regards the heavier classes of clay soil in the warmer parts of the country, there is general agreement that they should have a summer fallow, or at any rate a bastard fallow, before an attempt is made to grow wheat. At the latest the work should be taken in hand immediately after the hay harvest. Steam tackle is of special value. The surface should be torn up by the cultivator and exposed to the sun so as to dry out and kill the turf and mellow the surface layer of clay. The turf on land of this description is usually full of weeds, especially of bent (*Agrostis*), which unless killed would prove very troublesome in arable land; it is, therefore, necessary to dry the turf on the surface, whereas when soils are deep and the turf is thick and of good quality, the tillage must aim at burying and rotting the surface herbage. The actual management of these clay pastures must vary with the season. When broken up before mid-summer the land can scarcely be too rough, the sun and rain will mellow the clods, and there will be time to work them into a wheat seed-bed

before the autumn. Later in the season, till mid-August, a moderately moist soil, a flat, shallow furrow, cross ploughing and subsequent cleaning by the use of the cultivator and harrow are necessary. There would not be enough sun to bake large lumps properly, and autumn might find the land full of bent. When there is a choice the best results follow the early use of steam tackle, for as there is no tilling implement that can equal frost on a strong loam, there is none that can search out and mellow a raw clay soil so well as the summer sun.

To make a success of wheat on a clay soil broken up from grass, a bastard fallow is almost an essential preliminary in the south-east.

When grass has been broken up after harvest, winter oats or beans may be sown, but, as a rule, sowing should be deferred until spring.

When heavy loams or clay soils covered by inferior herbage cannot be tackled in summer, and must of necessity be broken up in autumn and winter, the best plan will probably be to plough as deep as possible, invert the furrow slice, and endeavour to rot the surface weeds before spring tillage begins.

Spring oats on newly-broken clays may do fairly well in the Midlands or the North, but, as a rule, are unsatisfactory in the South. Peas would appear to be the best crop for March sowing on this class of land, if beans cannot be sown in February.

Poor, clay soils are usually very deficient in phosphates and should get 2 to 4 cwt. per acre of basic slag before the seed is sown. In dry districts and for spring crops 2 to 3 cwt. of superphosphate may be substituted. From ½ to 1¼ cwt. per acre of sulphate of ammonia may often be usefully applied to cereals on land of this description.

Good Grass on Heavy, Clay Soil.—Good grass on stiff land has a special value; not only are the feeding properties high, but it withstands dry weather when other pastures become bare. Although, when labour is abundant and the land is well drained and well managed, it may grow fine crops of wheat and beans, good pastures on clay land should not be broken up under existing conditions.

(iii.) **Derelict Land.**

Very Poor Grass on Stiff, Clay Soil.—As a rule this should not be broken up at present: the labour available can be put to better uses. Very poor grass is usually found on cold, wet soils very deficient in phosphates, and not only expensive tillage but liberal manuring would be needed. Even then the

success of corn crops would be very uncertain. Land of this description should never be broken up until the surface has been enriched by the growing of white clover and other leguminous plants which cover such soils after they have been dressed with basic slag.

Very Light, Sandy Soils and Heaths.—These are easy to till, but, as a rule, they should not be broken up while labour is scarce, except in the neighbourhood of camps where there is an abundance of manure. Such soils, besides being readily injured by dry weather, usually want large quantities of artificial manures and lime. Potash manures, which are specially necessary, are at present so scarce that they should be reserved for land of better quality.

An attempt has been made in the foregoing pages to indicate how grass land should be broken up (examples from all parts of the country are quoted in the Appendix to the Report). The essence of the experience of 1917 is contained in a Yorkshireman's maxim, "Tread the turf well or else you will have trouble"; but everyone who has had long experience of tillage land knows how variable are the problems presented by the ploughed field, and how impossible it is to give directions for the successful management of all types of soil which the British farmer ploughs, in all the "samples" of weather with which the British climate can be credited. Grass land must be broken up, and to this task the farmer is expected to give all his skill and knowledge in the coming year. He must not, as in the case of the Welsh critic, wait until the corn is laid before he comes to the conclusion "what absolute fools the Authorities are"; he must be guided by his experience, and then, like a Cumbrian farmer who, though vexed by the agents of the Government, ultimately triumphed by the exercise of "practical common sense," he will, it may be predicted, in four cases out of five, grow a satisfactory crop in 1918; since, fortunately for the country, "practical common sense" is not monopolised by the farmers of Cumberland.

THE NATIONAL FOOD SUPPLY IN PEACE AND WAR.*

The statistics published by the Food Committee of the Royal Society upon the National Food Supply† afford the material for a consideration of the best means of utilising the available supplies of food in the present emergency.

For an estimate based on the relative value of foodstuffs it is convenient to take a unit which is common to all food. While due allowance may be made for the value of the class of substance known as vitamines in the promotion of growth, and as a preventive against diseases, such as scurvy or beri-beri, the main value of food is its service as fuel for the machinery of the human body, and just as the work-producing power of coal, oil, or petrol is measured in calories or units of heat, so the value of food may be measured in calories or the power which a human being derives for doing his work from the oxidation of his food.

The tables of the Food Committee show that in the five years before the War the nation was consuming food representing the huge total of 51 million millions of calories. Allowing for the smaller amount consumed by women, children, etc., this would show an average of some 4,000 calories for each average man per diem, or 15 per cent. in excess of the 3,400 calories which is the generally accepted standard of diet for an average man doing an average day's work. This diet was made up in the following proportions: 26 per cent. bread, 4 per cent. for flour used in cooking, 4 per cent. for other cereals, meat 18 per cent., dairy produce 15 per cent., sugar 13 per cent., potatoes 10 per cent., and all other foods 10 per cent. Thus, during the five years before the War, cereals contributed over one-third of the total work-producing power of the nation. The reason for this is obvious. In no other food which can be bought in sufficient quantities can so much work-producing power be obtained at so little cost. At pre-war prices a penny bought nearly 900 calories, and even at 3*d.* a pound it provides 400 calories. Where more money is available for household expenses, meat to a great extent takes the place of bread, and families which can afford to buy meat consume less bread in proportion. But in times of

* This article is in the main a summary of a pamphlet with the same title by Prof. T. B. Wood, of Cambridge, published by the Cambridge University Press. Price 6*d.*

† *The Food Supply of the United Kingdom* [Cd. 8421], published by H.M. Stationery Office, Kingsway, W.C. Price 4*d.*

stress and dearness, the tendency is to fall back more and more upon the cheaper food.

These considerations go to show the immense importance of securing an adequate supply of breadstuffs in the national interest. A war food policy should undoubtedly include a campaign against waste, but it is clear from the figures given above that even the most rigid economy would not effect any considerable saving. The total amount of waste in all foods in a time of plenty only amounted to 15 per cent., of which the bulk was animal fat. On the other hand, any reduction of the consumption of food below the limit of 3,400 calories which are required by the average man can only be achieved by a sacrifice of national efficiency. The principal aim of a sound war food policy should therefore be to secure an extension of the supply of breadstuffs. This may be done both by importing more wheat and by growing more at home. But neither of these solutions is easily attained in time of war. The shortage of the world's harvests and of available shipping make importation increasingly difficult, while the conversion of pasture into arable land at home is a matter that requires time before any considerable result can be achieved. There is, however, another method which appears to offer a satisfactory solution to the problem, and one that can be put into practice with every prospect of securing the desired results at an early date. Some 17,000,000 tons of cereals were consumed annually in these islands in the years 1909-1913, of which about $6\frac{1}{2}$ millions were grown in the country and about $10\frac{1}{2}$ imported. Of this great total only just over $5\frac{1}{4}$ million tons were used as human food, $\frac{1}{2}$ million tons were reserved for seed, $1\frac{3}{4}$ millions went to brewing and distilling, 300,000 tons to other industries, and over 9 million tons were used for fodder. Thus by far the greatest part of the grain available before the War was consumed by animals, and of the entire total less than one-third was used for human food—actually less, indeed, than the amount produced in our own cornfields. Clearly then, if it is possible to distribute the available supplies of grain in a different manner, a very much larger proportion of the supply might be made available for the food of the people. If the various claims upon the country's supplies of grain are considered separately, it will be seen that it is not possible to reduce the amount required for seed—indeed, that is likely to be largely increased because of the measures taken to bring a large quantity of fresh land under the plough. On the other hand, the amount of grain

for brewing has been reduced to about one-third of the pre-war figure, and the use of grain for making starch and for other industrial purposes has also been restricted.

There remains the largest item of all, that for fodder. The question therefore arises, is it possible to divert any portion of this food from animals to men? And this involves the subsidiary questions as to whether such a diversion would be economical from the general point of view, and whether it would not involve a dangerous depletion of the live stock of the country? The Royal Society Committee's Report shows that the live stock of the country, including not only the larger animals but poultry, game, rabbits, etc., provide about 6½ million tons of animal food containing about 1½ million tons of dry human food. But the live stock, including horses, consume 71 million tons of dry fodder, and allowing 11 million tons as the share of the horses it follows that the rest of the live stock consume 60 million tons of dry fodder and produce 1½ million tons of dry human food, or 40 tons of dry fodder for every ton of dry human food. If these figures are not sufficiently startling, it must further be remembered that these 60 million tons include grain and potatoes, equivalent to 6½ million tons of dry food, if eaten by human beings directly, but which, when converted into meat, would not be likely to yield more than ½ million tons of dry human food. It is not necessary to enlarge upon the wastefulness of this method of using cereals, and a detailed consideration of the facts will serve to show that a large proportion of the material can be usefully diverted from the feeding of animals to the nourishment of human beings.

Of the maize imported before the War, the bulk, or about 1½ million tons, was fed to pigs, and in this way produced not more than 150,000 tons of dry human food. Oats were chiefly fed to horses, but if the supply was restricted to working horses only and denied to those used for pleasure, ½ million tons would become available for human consumption. From barley and other grains, and from the closer milling of wheat, another 1½ million tons might be obtained, making 3½ million tons in all containing 3 million tons of human food, which, if fed to pigs (the most economical converter of grain into flesh), would only produce about 250,000 tons of dry human food. By these means and by the restrictions made in the amount of barley for brewing, and in the use of cereals for industrial purposes, the redistribution of the supplies of grain, other than wheat, would be somewhat as follows: Of a grand

total of 8¼ million tons, of which over 2¾ millions would be imported, about 3¼ million tons would be available for human consumption, rather less than 3¾ million tons would go as fodder, and the remainder would serve for seed, brewing and other industries. These 3¼ million tons thus set free for human food will provide some 2¼ million tons of flour. Any supplies which the nation requires beyond that amount must consist of *wheat*. It was shown at the outset that in peace time the nation consumed food to the value of 4,000 calories per day for each average man of the population, the number being estimated at 35 millions. In time of war, with a large number of men in the army and a very much larger number of men and women than in normal times engaged in active pursuits, involving a greater expenditure of energy, the amount of fuel required as food is increased proportionately. Owing to these considerations the estimate for population, in terms of man-power, should be increased by a million. Each of these units, in peace time, consumed per day 4,000 calories of food, of which 34 per cent. consisted of cereals. The work-producing power of 1 lb. of flour is 1,650 calories, and accordingly we shall be on the safe side if we allow 1 lb. of flour per average man per day. On this basis the national demand for cereals for the whole year will amount to 6 million tons, and allowing for the possibility of decreased digestibility of the food due to the new milling regulations and other contingencies, it will be safe to put this down at 6½ million tons. Deducting the 2¼ million tons of flour obtained by rescuing the other cereals from cattle fodder and reckoning home-grown wheat as another million tons, supplying ¾ million tons of flour, there remains a balance of 3½ million tons of flour to be supplied by importation, and 4¼ million tons of wheat would give this amount of flour together with nearly a million tons of offal. The amount of wheat and other cereals which the country would require to import under this scheme would thus be 7 million tons, as compared with 10¼ million tons imported annually before the War. It would therefore mean a saving of over 30 per cent. of the tonnage employed on this service in time of peace.

The question naturally arises: Can the live stock of the country be maintained in a state of efficiency in face of the reductions of fodder which have been suggested? Fodder may be divided into two classes—coarse fodder, which is necessary for maintenance, that is for keeping an animal alive and in health, and productive fodder, which is suitable for production, such as growth, meat, milk or work. For the purpose of

maintenance coarse fodder alone is sufficient, but for production concentrated foods, roots, good quality grass or hay are required. There is no reason to anticipate a shortage of coarse fodder, but the supply of productive fodder will be reduced from 28 to 24 million tons, reckoned as dry food. Broadly speaking, therefore, it will be possible to maintain our live stock, but it will not be possible to produce so large a total output of growth, meat, milk and work.

It remains to inquire how the sacrifice may be distributed most advantageously. Both agriculture and industry would suffer if productive fodder were withheld from working horses, and some 3 million tons of concentrated foods, chiefly oats, must be allotted to horses employed in productive work. It is equally necessary to keep up the supply of milk, especially as a given quantity of fodder yields more food in the form of milk than in any other way. At least 1 million tons of concentrated food, chiefly oil cakes and wheat offals, must be reserved for this purpose. Thus, rather less than 3 million tons of productive food will remain to be divided among the remainder of the live stock of the country, or about one-half of what they used to consume in time of peace. The remaining animals are used for the production of meat for food and, as already indicated, this is apt to prove a wasteful method. How far this is the case is shown by the following figures: For every pound of dry human food which it produces a cow or a pig consumes 12 lb. of fodder, a fowl consumes 14 lb., a sheep 24 lb., and a steer no less than 64 lb. The food of cows and sheep is chiefly grass, roots and hay, which are not as a rule suitable for human food, and these animals are also valuable as producers of milk and wool. But pigs and fowls are large grain consumers, and it is essential that their diet should be restricted to such grain as is unfit for human food, supplemented by any refuse that may be available.

A great saving can also be effected by slaughtering the animals at an earlier stage. Careful and prolonged investigation has shown that the practice of fattening stock is an extremely wasteful one. The amount of fodder consumed yields a constantly diminishing amount of food, so that an animal weighing about 1,000 lb., which produces 1 lb. of food for every 8 lb. of concentrated food it consumes in the first month of fattening, requires 35 lb. to produce every additional pound of dry human food in the sixth month. It is therefore clear that the longer an animal is kept before it is finally prepared for the butcher, the more fodder it wastes on maintenance. A three-year-old steer,

by the time it is ready for slaughter, will have consumed 8 tons of dry fodder, and rather more than half of this will have been used up in maintaining the vital functions of the animal. If it were slaughtered at 18 months instead of 3 years, at least 3 tons of maintenance fodder would be saved and only 30 to 31 lb. of dry fodder would be required instead of 64 lb., to produce a lb. of dry human food. It is therefore obvious that the live stock which was not required for milk or work should be treated as indicated in the general interest of the nation. Pigs and poultry should only receive such scraps and waste and damaged corn and offals as are not fit for human food. Cattle and sheep should be slaughtered in a much less fat condition than has been customary in the past, and every effort should be made to secure early maturity. The adoption of this policy will effect great economy in concentrated feeding stuffs and will, by bringing animals to the butcher more quickly, cause such a reduction in numbers as will equalise the demand for feeding stuffs and the supply.

It is, of course, important that this reduction should be so regulated as not to deplete the stock of high-class animals for breeding. But this result can be obtained if the authorities keep themselves fully informed of the stocks of animals in the country, and if they take steps, in the light of this knowledge, to prevent the slaughter of milking cows and to increase or decrease, as occasion may require, the rate of slaughter of other animals. If the total reduction in live stock brings down the numbers to such a level that the normal meat supply can no longer be maintained, the importation of meat must again be increased. But even in this case, it is clear from the figures which have been quoted that the importation of ready-made meat will make considerably less demand upon tonnage than would the importing of raw materials for the production of the same quantity of meat at home.

CORN PRODUCTION ACT, 1917.

I.—THE PRINCIPAL PROVISIONS AS REGARDS AGRICULTURAL WAGES IN ENGLAND AND WALES.

THIS article is intended for the information of persons engaged in agriculture who are affected by the provisions of the Corn Production Act relating to minimum rates of wages. It gives a general idea of the main provisions of the Act in this respect, but it must not be regarded as a full and authoritative interpretation of the measure. The Act itself should be consulted in the case of any dispute or uncertainty.

The main provisions of the Act relating to minimum rates of wages in England and Wales are set out in Part II. (Sections 4, 5, 6 and 7), and in the first Schedule to the Act. Certain definitions and additional provisions are contained in Part V. (Sections 12, 14, 16 and 17). Special provisions as to minimum rates of wages in Scotland and Ireland are contained in Section 18 and in the second and third Schedules to the Act.

1. **Agricultural Wages Board.**—The Act provides for the establishment by the Board of Agriculture and Fisheries, after consultation with the Minister of Labour, of an Agricultural Wages Board for England and Wales. The main object for which the Wages Board is established is the fixing of minimum rates of wages for "workmen" employed in agriculture, that is to say, rates of wages which, in the opinion of the Wages Board, are the lowest which ought to be paid to "workmen" in the district for which the rates are fixed. The term "workmen" includes boys, women and girls, and employment in agriculture includes work not only on farms, but also on osier land, woodland, orchards, market gardens and nursery grounds.

2. The minimum rates when fixed will be legally payable as explained below.

3. **Constitution of the Wages Board.**—The Wages Board will consist of three classes of persons: (*a*) "appointed members," that is to say, persons directly appointed by the Board of Agriculture and Fisheries who are not necessarily engaged in agriculture, but are expected to form an impartial judgment as between employers' and workers' interests; (*b*) members representing employers; and (*c*) members representing workers.

4. Women are eligible as members of the Wages Board as well as men.

5. The numbers of appointed and of representative members of the Wages Board will be fixed by Regulations made by the Board of Agriculture and Fisheries, and those Regulations will also settle the methods of choosing members to represent employers and members to represent workers respectively. The Chairman and Secretary of the Wages Board will be appointed by the Board of Agriculture and Fisheries.

6. *The members representing employers and the members representing workers must be equal in number.* The appointed members must not be greater in number than one quarter of the total number of members of the Wages Board.

7. **Minimum Rates of Wages.**—It will be the duty of the Wages Board to fix *minimum rates of wages for time-work* for all classes of workers, and they may, if they think it necessary or expedient, also fix *minimum rates of wages for piece-work.* These rates, whether for time-work or for piece-work, may be fixed so as to apply universally to workers employed in agriculture, or they may be different for different districts, or for different classes of workers, or for different kinds and conditions of employment. In the case of *able-bodied men,* the minimum rates fixed for *time-work* must be such as will secure wages which, in the opinion of the Wages Board, are equivalent to payment for an ordinary day's work at a rate of *at least* 25*s. a week.* This provision does not apply in the case of boys, women and girls. In computing the wages, the value of such customary allowances as are not prohibited by law may be included in so far as the Wages Board may authorise and on a basis of value to be fixed by the Wages Board. Deductions from cash wages in respect of an allowance of intoxicating drink are illegal under the Truck Acts.

8. In fixing minimum rates, whether for time-work or for piece-work, the Wages Board are required by the Act to secure, so far as practicable, for able-bodied men such wages as are, in the opinion of the Wages Board, adequate to promote efficiency and to enable a man in an ordinary case to maintain himself and his family in accordance with such standard of comfort as may be reasonable in relation to the nature of his occupation.

9. *Any minimum rates fixed under the Act will be without prejudice to the payment,* under any agreement entered into or custom existing before the passing of the Act, *of rates higher than the minimum rates.*

10. The term "able-bodied man" means any male workman who is not incapable, by reason of age, or mental or other

infirmity, or physical injury, of performing the work of a normally efficient workman.

11. **Procedure in Fixing Minimum Rates.**—Before fixing any minimum rate of wages the Wages Board must give notice of the rate which they propose to fix, and must consider any objections which may be lodged with them within one month; and when a rate has been fixed, notice of such rate must be given by the Wages Board for the information of the employers and workers affected.

12. The Wages Board may, if they think it expedient, after due notice, cancel or vary any minimum rate fixed by them, and must reconsider any rate if directed to do so by the Board of Agriculture and Fisheries.

13. **Enforcement of Minimum Rates of Wages.**—When a minimum rate of wages has been fixed, any agreement for the payment or acceptance of wages at less than the minimum rate is void, and payment of wages at less than the minimum rate renders the employer liable to a fine of not more than £20, and to a fine not exceeding £1 for each day on which the offence is continued after conviction therefor, unless he proves that he did not know and could not with reasonable diligence have ascertained that the wages paid were at a rate less than the minimum rate.

14. In cases, however, where the Wages Board are satisfied that a worker on time-work is affected by any mental or other infirmity or physical injury which renders him incapable of earning the minimum time-rate applicable, they may grant the worker a *Permit of Exemption*; and so long as any conditions prescribed by the Wages Board on the grant of the permit are complied with, the employer is not liable to penalty for paying the worker wages at less than the minimum rate.

15. Where legal proceedings are taken against an employer for the payment of a worker at less than the minimum rate, the Court may, whether they convict the employer or not, require him to pay to the worker any arrears of wages which may appear to the Court to be due to the worker by reason of his having been paid at less than the minimum rate.

16. Any worker may complain, or may authorise another person to complain, to the Wages Board that he is being paid wages at less than the minimum rate fixed by the Wages Board, and the Wages Board may, if they think fit, take proceedings on behalf of the worker, either for the recovery of the arrears

of wages due to the worker or by way of prosecution of the employer.

17. Moreover, a worker may take proceedings on his own behalf for the recovery, as a civil debt, of any arrears of wages which may be due to him in respect of his payment at less than the minimum rate.

18. Where a worker is employed on piece-work and a minimum time-rate, but no minimum piece-rate, has been fixed by the Wages Board for the work on which he is employed, the worker may complain, or may authorise another person on his behalf to complain, to the Wages Board that the piece-rate paid to him is so low that the earnings of an ordinary workman paid at such rate would be less than he would have earned for the same work at the minimum time-rate applicable to the case; and the Wages Board in that case may direct the employer to pay the difference. The worker may recover from the employer summarily as a civil debt any sum which the Wages Board so direct to be paid.

19. *Officers* may be appointed by the Board of Agriculture and Fisheries for the purpose of investigating complaints and otherwise securing the proper observance of the provisions of the Act relating to minimum rates of wages.

20. These officers have power to require the production of wages sheets and other relevant information.

21. Persons who refuse to produce documents or give information which the officers have power to require, or knowingly furnish the officers with false wages sheets or other false information, are liable, on conviction, to a fine not exceeding £20, or to imprisonment for not more than three months with or without hard labour. The officers have power, in pursuance of directions of the Board of Agriculture and Fisheries, to take legal proceedings for the enforcement of the Act.

22. **District Wages Committees.**—The Wages Board may, and if required by the Board of Agriculture and Fisheries must, establish District Wages Committees to act for such areas as the Wages Board may determine. Any District Wages Committees established will consist of representatives of employers and workers and also of such persons as the Board of Agriculture and Fisheries may appoint. Their composition is settled by Regulations made by the Board of Agriculture and Fisheries. There will be equal representation, on a District Committee, of local employers and local workers, and at least one member of the Wages Board or other person nominated

by the Board of Agriculture and Fisheries will act on each District Committee.

23. It is the duty of District Wages Committees to recommend to the Wages Board minimum rates of wages applicable to their districts. Minimum rates of wages can only be fixed, varied or cancelled by the Wages Board itself, but no minimum rate fixed to apply to an area for which a District Wages Committee has been established, and no variation or cancellation of such rate, can have effect in that area unless the District Wages Committee has either recommended the rate or its variation or cancellation, or has had an opportunity of reporting thereon to the Wages Board.

24. The Wages Board may refer any matter to a District Committee for report and recommendation, and may also delegate to a District Committee any of their powers and duties (other than their power and duty to fix minimum rates of wages). They may also authorise a District Wages Committee to delegate any such powers to a sub-committee. Among the powers which may be so delegated is that of issuing Permits of Exemption.

25. **Expenses and Remuneration of Members.** — Expenses incurred with the consent of the Board of Agriculture and Fisheries by members of the Wages Board or a District Committee, and sums paid with such consent to members by way of compensation for loss of time, will be paid out of public funds.

26. **Provisions of the Act now in Force.**—Some time must necessarily elapse before the Wages Board and District Committees are set up and the above provisions come into operation. In the meantime an *able-bodied man employed on time-work* (but no other class of worker to whom Part II. of the Act applies) who since the commencement of the Act, viz. the 21st August, 1917, has received payment of wages (including allowances) at a rate which, in the opinion of the Court, is less than the equivalent for an ordinary day's work of 25*s*. a week, will be entitled to recover the difference from his employer as a civil debt, at any time within three months after the minimum is fixed. The value of allowances in such cases will, in case of dispute, be determined by the Court.

It is advisable, therefore, that employers should at once arrange to pay all able-bodied men employed in Agriculture on time-work, wages for an ordinary day's work equivalent to at least 25*s*. per week, and should provisionally agree with such

workers as to the customary or reasonable value of any allowances which are reckoned as part payment of wages. It is illegal under the Truck Acts to reckon beer or cider or other intoxicant as allowances in part payment of wages.

II.—RESTRICTION ON RAISING OF AGRICULTURAL RENTS.

Part III. of the Corn Production Act, 1917 (*see p.* 628), is intended to protect tenants of agricultural holdings from losing through increase of rent the benefit of the minimum prices for wheat and oats which Part I. of the Act guarantees for the six years 1917–1922. With this object the Act prescribes, as the highest permissible rent, the rent which could have been obtained if minimum prices had not been guaranteed, but this applies only where the contract of tenancy has been made or varied after the passing of the Act, *i.e.*, after the 21st August, 1917.

If a tenant has reason to think that the rent he is asked to pay is higher than could have been obtained if minimum prices for wheat and oats had not been guaranteed, and he is unable to arrange for its reduction accordingly, he can require the question to be referred to a single arbitrator under and in accordance with the provisions of the Second Schedule to the Agricultural Holdings Act, 1908; but written notice requiring the question to be referred to arbitration must be served by the tenant on the landlord, either personally or by registered post, within one year from the time when the old contract of tenancy is varied, or the new tenancy commences. The fact that a tenant has agreed to the new rent does not take away his rights in this respect.

While the arbitration or the preliminary proceedings are in progress, the tenant must pay the rent stipulated in the contract of tenancy; he cannot withhold any part of that rent on the ground that the question whether it is permitted by the Act is to be or is being determined by arbitration. But, if the arbitrator eventually determines that the agreed rent is above what the Act permits, the tenant can get back, by deduction from rent or otherwise, whatever he has paid above the rent allowed by the arbitrator, since the contract was varied or the new tenancy commenced; and the tenancy will continue at the reduced rent.

The costs of, and incidental to, the arbitration and award are in the discretion of the arbitrator, who may direct to and by whom and in what manner these costs or any part thereof are to be paid, and, in awarding costs, he is to take into

consideration the reasonableness or unreasonableness of the claim of either party, either in respect of amount or otherwise. It is therefore very desirable that a tenant should not begin arbitration proceedings unless he is satisfied that he has a strong case for proving that his rent is higher than the Act permits. The arbitrator, unless appointed by agreement between the parties, is appointed by the Board of Agriculture and Fisheries.

To avoid misapprehension attention is called to the following paragraphs :—

(1) The Act does not in any way affect the existing law as to the determination of tenancies, whether by notice to quit, by the expiration of a lease, or from any other cause. It gives the Board of Agriculture and Fisheries no power to intervene, and it gives tenants no right of appeal to arbitration in such cases, even though it may be alleged, *e.g.*, that notice to quit has been given in order to obtain an increase of rent not permitted by the Act. Part III. does not enable a tenant to refer to arbitration the question as to whether the rent payable, or demanded on renewal, is a fair rent.

(2) Though the legal right of appeal to arbitration only arises *after* a contract of tenancy has been made or varied, there is nothing to prevent a landlord and an existing or would-be tenant agreeing to a rent subject to a reference to arbitration of the question as to whether the rent is in excess of that permitted by the Act. A tenant who gives up a holding, rather than agree to pay the rent demanded on renewal, cannot appeal to arbitration under the Act ; nor has he any right to resume occupation of the holding even though it may be decided subsequently in proceedings instituted by his successor, that the rent demand was in excess of that permitted by the Act.

(3) The Act does not make it illegal for a landlord to obtain the best rent he can for his land, provided that the effect of the guaranteed prices is left out of the account. The fact that the new rent is no more than may be required in order to meet the landlord's increased outgoings is no legal justification for the increase. The only point to be considered is whether the increase could have been obtained if the maximum prices had not been guaranteed.

Part III. applies to any parcel of land which is wholly agricultural or wholly pastoral, or in part agricultural and as to the residue pastoral, or in whole or in part cultivated as a market garden, and which is not let to the tenant during his continuance in any office, appointment, or employment held under the landlord, but as the Act guarantees minimum prices for wheat and oats only, the restriction which it contains on the raising of rents applies primarily to arable land or land which it is intended to turn into arable.

Corn Production Act, 1917: Part III.

"8.—(1) The rent payable under any contract of tenancy made or varied after the passing of this Act in respect of an agricultural holding shall, notwithstanding any agreement to the contrary, not exceed such rent as could have been obtained if Part I. of this Act had not been in force, and any question as to whether the rent payable under such a contract is in excess of the rent permitted by this Section or as to the amount of the excess shall be determined by a single arbitrator under and in accordance with the provisions of the Second Schedule to the Agricultural Holdings Act, 1908;

"Provided that the rent payable under a contract of tenancy shall not be deemed to be in excess of that permitted under this Section unless notice in writing requiring the question to be referred to arbitration has been served on the landlord within one year from the commencement or variation of the tenancy.

"(2) If on any such arbitration it is determined that the rent payable under the contract of tenancy is in excess of the amount permitted under this Section, the contract shall, as from the commencement or variation of the tenancy, have effect as if the rent payable under the contract was reduced by the amount of the excess.

"(3) This Section shall not affect any proceedings by a landlord for enforcing payment of any rent except so far as the rent has before the commencement of such proceedings been determined in manner hereinbefore provided to be in excess of the rent permitted by this Section, but any rent in excess of the rent permitted by this Section which is paid or recovered before the award of the arbitrator shall be recoverable by the tenant from the landlord by way of deduction from rent or otherwise.

"(4) In this Section expressions have the same meaning as in the Agricultural Holdings Act, 1908."

Copies of the Act (price 3*d.*, or by post 4*d.*) and of any Regulations made under it may be purchased, either direct or through any bookseller, from H.M. Stationery Office, Imperial House, Kingsway, London, W.C. 2.

NOTE.—*Copies of either part of this article may be obtained post free on application to the Secretary, Board of Agriculture and Fisheries, 4, Whitehall Place, London, S.W. 1.*

THE STORAGE OF POTATOES.*

IT is of great importance that all potato crops should be stored under proper conditions. Even when every precaution is taken, the wastage of potatoes during the winter is considerable; under bad conditions of storage it is very great indeed, and may even amount to the whole crop.

In order that the best methods may be adopted by small cultivators, those who have not had experience in the storage of potatoes should know the chief causes of wastage. These causes are:—

(1) sweating, heating and consequent rotting; often due to insufficient ventilation,

(2) rotting: due to exposure to rain or to the potatoes being wet or immature when put into storage,

(3) injury from frost: due to insufficient protection from hard weather,

(4) decay: owing to disease in the tubers at the time of storage.

Loss is also caused by the sprouting of the tubers in spring.

It is not possible to prevent altogether losses from these causes, but, by using the best methods of storage, it is possible to reduce them very materially.

This may be done by taking care to guard against loss from each of these causes:—

(1) *Sweating and heating* occur if freshly dug potatoes are stacked in too large heaps so that air cannot circulate between the tubers. The risk of loss from this cause is greatest in the autumn immediately after the tubers have been lifted, and it is therefore important that potatoes when lifted should not be put in unnecessarily large heaps nor kept in an ill-ventilated shed or room.

(2) *Rotting from exposure to rain.*—If potatoes are lifted in wet weather, or are exposed to rain during storage, rotting is sure to occur. It is therefore necessary to protect the stored potatoes from rain.

(3) *Injury from frost.*—Potatoes are easily damaged by frost, and if they become frozen their market value

* Food Production Leaflet No. 6.

is destroyed. Therefore every precaution must be taken to protect the tubers from frost.

(4) There are several diseases of the potato which destroy the tubers, and if diseased tubers are mixed with sound ones disease may spread. Therefore it is necessary to look over the potatoes which are to be stored and to take care that even slightly diseased tubers are not stored with the sound tubers. Before storing grade the potatoes, separating them into ware (large—above 2 oz. in weight), medium (seed size—1½ to 2 oz.) and small (chats). Very small, misshapen and diseased tubers should be given to pigs or poultry; but the diseased potatoes should not be given raw; they should first be boiled in order to prevent the germs of disease from getting into the manure and thence back on the land.

Even after careful sorting some diseased tubers are sure to escape notice and to be mixed with sound tubers. To prevent disease spreading from them to the sound tubers it is advisable to sprinkle powdered quick-lime, or a mixture of quick-lime and flowers of sulphur, among the tubers. The sulphur helps also to keep away vermin.

Lifting.—The potatoes should be ready for lifting as soon as the haulm has died down. To tell whether the crop is ready for lifting remove the soil from about a root, take up one or two tubers and note whether the skin is "set," that is, does not rub off easily. If the weather is wet they may be left for a time in the ground. In that case it is advisable to cut off and remove the haulm, as otherwise disease present in the tops might reach the tubers. Lift in dry weather and leave the tubers on the ground only long enough for the skins to dry. As the potatoes are being picked up they should be sorted and graded and the diseased tubers removed. If part of the crop is to be used for planting next year the tubers of seed size should be set aside for boxing. If none are to be kept for seed all tubers above 1½ oz. should be stored. The sound tubers may either be clamped at once, or if the quantity of potatoes and the supply of labour allow of it the tubers should be spread in heaps near the clamping ground—in the driest part of the garden or field—covered with a layer of bracken (fern) or litter to give protection from rain, and picked over *at intervals of two weeks*. If this is done some tubers which appeared to be sound when lifted will be dis-

covered to have become diseased. By the removal of such unsound tubers subsequent wastage will be greatly reduced.

In case of an early spell of frosty weather the heaps must be protected by means of a temporary covering of litter and earth.

If this course is followed the final clamping as described below should be done about the end of November or in early December.

Storage.—Where large quantities of potatoes have to be dealt with, a clamp or pie must be made; but for small quantities a cool, dry, frost-proof shed is the best store. The potatoes are spread in layers on the floor either directly or resting on straw or bracken (fern) or sacking. The depth of the layer of potatoes must not be more than $2\frac{1}{2}$ ft., or the tubers may become heated and begin to sprout. Potatoes to be used for food should be covered with straw, litter or sacking so as to keep out the light. The shed should be ventilated on all suitable occasions. During spells of specially hard weather every care must be taken to keep out frost, for example, litter may be scattered lightly and thickly over the heap.

Storage in the Larder.—Where there is no shed suitable for use as a store and where the quantity of potatoes to be stored is not too great the tubers may be placed in *thick* bags and kept in a larder. Quick-lime or lime and flowers of sulphur lightly sprinkled among the tubers will help to keep down disease. During late autumn they should, if possible, be looked over once a fortnight and diseased tubers removed. In winter old sacking thrown over the sacks will protect the potatoes from frost, and in very severe weather extra covering should be put on at night and removed in the morning, or at all events at the end of the frost.

Storage "in the Roof."—In many small houses there is space beneath the roof which in the absence of more convenient storage-room may be used.

The potatoes should be put in boxes and the boxes stood on boards on the rafters and covered with old sacking or with several layers of crumpled newspapers. The potatoes should be inspected occasionally and diseased tubers removed. In severe weather the boxes must be protected from frost.

Storage in Cellars.—If no more suitable place is available potatoes may be stored in a cellar; but in that case careful

attention must be paid to *ventilation*, particularly during the first months of storage. The door should be kept open and the window also when the weather is not too rainy.

If the cellar has a dry earth floor the potatoes may be laid directly on it ; but if the floor is damp the potatoes may be placed in boxes resting on bricks ; or a layer of straw may be laid on the floor and the potatoes placed in shallow heaps 8 or 10 in. deep. The heaps should be covered lightly with straw or with dry heather, bracken or dry branches. The potatoes should be looked over from time to time and diseased tubers removed.

Storage in Clamp or Pie.—Storage in a clamp or pie is in many respects the best method, but it cannot be used if there is danger of loss by pilfering.

To make a Clamp or Pie,—Select the driest part of the ground. Mark out a strip 3 ft. 6 in. wide and long enough to take the potatoes to be stored.

Having graded the potatoes pile them in a heap with sides as upright as possible—in the shape of the letter A. Cover the sides and ends of the clamp with a layer of long wheat straw 4 in. in thickness, taking care that the lower ends of the straw are pressed close to the ground, for it is along the edge of the clamp that frost most often gets in. The long straw layer should reach almost to the top of the potatoes. To keep the straw in place, throw a layer of earth along the lower edge of the clamp. In order to keep off rain, a covering of long straw (wheat or barley—not oat straw) is placed over the ridge so that the ends *overlap* the straw at the sides. By this means any rain which falls will run down the outside and not into the clamp. The straw may be kept in position by means of a layer of earth 3 in. thick covering the sides from the base up to 4 in. from the cap of the ridge.

At the approach of winter the clamp must be finished. This is done by covering the clamp except along the middle of the ridge with a *thick* coat of soil dug out from along the sides. As a result of the digging a drainage trench a foot or so wide and 6 in. deep is formed. An outlet is cut in the trench to allow water collecting there to drain away. The earth is worked on the sides and ends with a spade, and is made firm and smooth as the clamping proceeds. A thickness of 6 in. of earth is quite sufficient to give protection against moderate frosts ; but in very severe weather, such as that experienced last winter, even 12 in. may not be enough. It

should be remembered, however, that too much soil encourages the stored potatoes to grow in the clamp. Finally put a thick layer of short litter along the ridge.

For *small* lots, of one ton or less, the clamp may be made in the shape of a cone, with a round base, built up as high in the centre as the base allows and well strawed with as straight straw as can be obtained.

Unless the clamp shows signs of giving way owing to the rotting of the tubers, it may be left undisturbed until February. It should then be opened and the potatoes inspected. If left longer they are likely to sprout vigorously, and in that case much of the goodness in the potatoes will be lost.

Storing Seed Potatoes.—Every care should be taken to prevent the exposure of seed potatoes to cold; for even at a temperature not low enough to kill the tuber the eyes may be permanently injured.

Scotch and Irish seed potatoes give the largest yield. Yields almost, if not quite, as large are obtained from "once grown" Scotch or Irish seed, provided that the seed is from Scotch or Irish potatoes grown for one year in a good potato district, for example, Lincolnshire, the Wisbech district of Cambridgeshire and parts of Yorkshire. By "once grown" Scotch or Irish seed is meant seed of potatoes of Scotch or Irish origin grown for one year in this country.

Because of the importance of obtaining seed not only true to name but also of known origin, growers should place their orders with firms of established reputation as soon as possible after they have decided upon their requirements for the coming year.

Lifting.—If it is intended to save tubers for seed purposes, the best course is to set apart a portion of the crop and to lift it before the tubers are fully ripe, for it is a well proved fact that immature tubers make the best sets.

Selection of Seed.—*First Earlies.*—Seed of first early varieties should consist of uniform, clean, ware sized tubers.

The selected tubers should be allowed to lie on sacking or on the ground for a few days and should be turned occasionally so that they become greened. By this means the keeping quality of the sets is improved.

The tubers should then be placed "crown end" uppermost in shallow boxes or trays, or on shelves one layer deep, in a

frost-proof, cool place, where they get as much light and air as possible. Tubers so "boxed" develop two or three, strong, green sprouts instead of a large number of weakly shoots, which they produce if they are pitted or kept in the dark. Sets (seed) so treated need not be cut at planting time nor need any of their sprouts be removed.

Second Earlies, Main crop and other Varieties.—The seed of these varieties should also be selected at the time of lifting. The tubers need not be so large as in the case of the first earlies. Tubers about the size of a hen's egg and of not less than 2 oz. in weight will make good seed, though, if required, larger tubers may also be used. Wherever it is possible the seed should be placed two or three layers deep in boxes, and the boxes stored in a well-lit, airy, but frost-proof place, such as a shed, outhouse, or disused room of a dwelling-house.

Where the quantity is too large for the seed to be treated in this manner, it must be clamped. When the clamp is opened in the spring, any sprouts which have been formed should be removed.

FARM ACCOUNTS: WINTERING LAMBS ON TURNIPS.

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THE object of this note on a farmer's experiences in wintering lambs on turnips in the year 1915–16 is to supply an example of how scientific book-keeping can assist the farmer in the management of his business. It is not to be inferred that the results shown here would necessarily be realised on the generality of farms, but on the farm in question, a mixed holding in the Midlands, the record of his operations, translated into figures, has been the means of bringing about a profitable change of management.

The custom for some time had been to grow a certain area of roots upon which the lambs were wintered with cake and corn, and from which they were sold off fat from about Christmas onwards. The prices realised seemed satisfactory, and the land was benefited no doubt by the treading and manuring, but when the test of book-keeping was applied the results were shown to be unprofitable. In 1915 the turnips and swedes occupied an area of 26 acres, and the cost of growing the crop was as follows :—

Cost of growing 26 acres of Turnips and Swedes in 1915.

	£	s.	d.
Manual labour	50	12	2
Horse labour	38	19	4
Purchased manure	20	16	3
Farmyard manure	53	3	8
Rent and rates	31	8	6
Seed	2	16	9
General expenses (including depreciation on implements)	28	19	0
	£226	15	8

Manual labour was calculated from a daily labour-sheet, and the amount charged includes a proportionate part of all payments in kind. Horse labour was recorded in days, and the cost of a day was worked out at the end of the year, when the total number of days worked by the horses and the total cost of keeping them was known. Purchased manure was charged at cost, the labour of carting and distribution being included in manual and horse labour. Farmyard manure was charged at the cost of the straw and food residues composing it. General expenses represent the proportion of the overhead charges, including depreciation on implements, chargeable against this crop, the division between the various departments being made upon the basis of the gross costs.

The total gross cost of the crop thus appears to be £226 15*s.* 8*d.*, but from this certain deductions have to be made. (1) The roots having been fed on, all the manures are carried forward, according to the local farming custom, to the charge of the next crop. (2) Turnips being a cleaning crop, and some of the cultivations performed being necessary to clean the land rather than to grow the roots, a certain proportion of the cultivation and of the general expenses must also be carried forward. The exact figure representing the amount to be carried forward should be arrived at for any root crop by an inspection of the record of the work done, as the operations will vary with the seasons, the condition of the land, and so on. Experience gained in farm accountancy at the Institute for Research in Agricultural Economics points to the fact that about one-third of these expenses in connection with the root crop represents, under average conditions, the charge due solely to cleaning, and in the case under consideration one-third of the cost of cultivations and of general expenses have been carried forward. The total cost of £226 15*s.* 8*d.* is

therefore reduced by £20 16*s.* 3*d.* in respect of purchased manures, £53 3*s.* 8*d.* in respect of farmyard manure, and £39 10*s.* 2*d.* (*i.e.* one-third of manual labour, horse labour and general expenses) in respect of cleaning costs, bringing the net cost of 26 acres of turnips and swedes to £113 5*s.* 7*d.*

The lambs in question consumed 9¾ acres of the whole area. There were 173 of them, and the cost of wintering them in 1915–16 works out as follows :—

	£	*s.*	*d.*
Manual labour	20	5	0
9¾ acres turnips and swedes	42	9	7
Corn, cake, etc., *less* manurial residues ..	46	5	8
General expenses	5	13	6
Total cost of wintering 173 lambs ..	£114	13	9

This represents about 13*s.* 3*d.* per head, and the sheep as sold off realised an average figure of 60*s.* 5*d.*

It is now possible to consider the financial results of the management of the lambs. Deducting the cost of wintering from the price realised, we get a figure of 47*s.* 2*d.*, which is to be compared with the price of store lambs at Michaelmas, 1915. Now the farmer himself had purchased other store lambs at this date, which cost him 50*s.*, and from his observations at fairs and sales at this time, he concluded that his own lambs would have made from 45*s.* to 50*s.* per head. It appears, therefore, that he had received nothing at all by way of reward for his own services, for interest on his capital, and for risk involved in wintering these sheep, and that a more profitable plan would have been to have sold them in the autumn as stores, and to have arranged the cropping of his land with that purpose in view. Nothing must be inferred from the result as to the general wisdom of wintering sheep on turnips, but on this particular farm the farmer was probably justified in drawing the above conclusion, for the results for the year given proved to be only a confirmation of those for the previous year.

PEASANT CO-OPERATION IN RUSSIA.

(Abstract of a Russian pamphlet by A. E. Kuluijnui.)

E. A. BRAYLEY HODGETTS.

The great strides which the co-operative movement has made in Russia in recent years are perhaps insufficiently known in this country, and for this reason the following abstract of a pamphlet which appeared in Russia just before the outbreak of the War may have especial interest.

The author describes the changes which have taken place in Russian agricultural life during the last 30 or 40 years, and shows that the increase of population had necessitated the abandonment of old and obsolete methods. A painful picture is painted of the hopeless financial and economic condition into which the usurer had got the peasants, for, instead of paying for the produce in money he did so in kind at inflated prices, and thus was rapidly ruining the rural population of Russia. The usurer, however, was not the only curse of the peasant. Agricultural produce frequently had to go through from 6 to 10 hands before the final market was reached, and each of the middlemen had, of course, to make a profit. As the market price was not dependent on the conditions obtaining in Russia, but was controlled by Hungarian, Indian, Canadian and Australian competition, it was always the peasant who suffered.

Such was the state of things that obtained in rural Russia some 20 or 30 years ago, and it is consequently not to be wondered at that the peasant became more and more impoverished and that famines were the order of the day. The conditions in Western Europe were not dissimilar, but there the peasants found a remedy in co-operation.

The example thus set has been followed by Russia, where a number of agricultural societies have of late years been founded by the peasants. These societies, composed of members of both sexes, hold meetings at which the needs and requirements of the members are discussed; they establish local public libraries; public lectures and discussions are held under their auspices; agricultural schools are founded, experimental and demonstration fields are established, model farms as well as nurseries for fruit trees are created; and so forth. Improvements in seeds and manures, agricultural implements and machinery, etc., are discussed, and agricultural shows are held for the exhibition and trial of agricultural

machinery. The societies also make it their object to supply their members with various agricultural requisites at reasonable prices, and erect for that purpose stores for agricultural implements, seeds, manures, timber, iron, tiles, etc. Further, they effect the sale of peasant produce by collecting and marketing grain, hemp, hay, eggs, etc. Finally, these agricultural societies have power to establish in villages credit associations, co-operative supply stores, bee-keeping and poultry-keeping societies, and similar useful institutions.

Perhaps the most important privilege of these societies, however, is the right of raising with the supreme agricultural authorities questions bearing upon the agricultural requirements of the district which they represent. The societies are legal corporate bodies and have the right to own movable and immovable property, conclude agreements, and generally transact business in their own name in accordance with the laws of the country. The liability of the members is, however, limited to their annual subscriptions.

The activities of the majority of existing agricultural societies in Russia are summarised as follows :—

(1) Propagating among the peasantry the best and most profitable methods of husbandry ;

(2) Assisting the peasants to purchase all the requirements needed for the improvement of their holdings, such as tools, machinery, seeds, manures, etc. ; helping them to obtain cheap articles of good quality, and wherever possible without the intervention of the middleman ;

(3) Collecting the peasant produce and marketing it in bulk ; and

(4) Facilitating, through the intermediary of the society, the use of such implements and machinery as the peasant could not individually afford to acquire.

It is stated that the peasantry have already appreciated the benefits to be derived from these village agricultural societies. Formerly agricultural societies were formed exclusively by the country gentry and were principally established in towns. The peasant societies, however, only appeared in the villages in recent years, but immediately grew and multiplied at a great rate. Thus, whereas up to 1901 there were no more than 200 such societies in existence, in 1902 this number had doubled, in 1905 there were more than 700, and the latest returns show that there are now more than 2,300. The provinces possessing the largest number of such societies are

Poltava, Samara, Saratoff, Perm, Vitebsk, Vyatka, Tchernigoff, Koursk, Novgorod, and Petrograd. Of course these numbers are very small compared with those of Western Europe, but it is maintained that they are increasing rapidly.

As showing the utility of the societies the operations of a society in the Province of Poltava, given in their last report, may be taken as an illustration. The peasant members held 12 meetings during the year at which papers on the following subjects were read by experts and subsequently discussed: "The agricultural needs of the peasants," "The forage market," "The various kinds of fruit trees," "Dung and artificial manures," "Emigration," "On the formation of a credit association and co-operative stores," "On the purchase of sheep of the Karakul breed," etc. Nevertheless, however useful such occasional papers may be, many societies consider this insufficient, and offer a permanent appointment to an agricultural adviser in order that he may be constantly consulted by the members. In the purchase of implements and seed, in the adoption of new methods of husbandry, and in connection with cattle and horses, the advice of such an expert, always available, is invaluable.

Many societies subscribe to the leading technical journals, have lending libraries and reading rooms, and have the latest agricultural publications on sale.

As papers and descriptions are not always sufficient to convince individual peasants of the excellence of the machinery or implements, agricultural shows are held at which competitions take place, practical demonstrations are given, and considerable sums are awarded as prizes.

A number of societies have started experimental fields, acquired either by purchase or by lease, only a few acres being required for the purpose.

The peasants are thus learning that new methods must be introduced and that the old 3-course system is antiquated, and the scarcity of forage has led to the adoption of 4-6 and even 8-course systems. The most popular seems to be the 4-course rotation: grass, winter crops, roots, oats. Various districts recommend systems in accordance with the local conditions. Some of the societies do not limit their operations to purely agricultural matters; in certain districts technical schools have been established by societies, where peasant girls are taught weaving; other societies have erected training smithies, repairing workshops, etc.

A very useful function performed by the rural agricultural societies is the mechanical cleaning of seed, thanks to which the crop yields have been enormously increased (to the extent of 20 per cent. and more), and better prices obtained for the crops. This work, which was initiated in 1899, has been making great progress, the societies providing the necessary winnowing machinery. Excellent results have been obtained in various districts. Drills have also been introduced by these societies, and even by the Zemstvos, and hired out to the peasants.

The laying down of good grass for cattle has also received a great stimulus, and is now being conducted on scientific lines, the local societies in many cases having succeeded in obtaining subsidies from the Department of Agriculture for the purchase of suitable seed.

The question of cattle and horse-breeding has been similarly placed on a satisfactory basis by these societies which provide bulls and stallions, etc.

The co-operative purchase of requirements and the joint sale of agriculture produce are, of course, the principal problems of the peasants. In Western Europe the problem has long been solved by co-operative associations, but in Russia the entire business, including the erection of storage accommodation, the sale of grain, etc., had to be carried out by the local rural societies. It was not until 1908 that the Government sanctioned the formation of co-operative associations and drew up model by-laws and articles of association.

The rural societies have, however, filled this gap by opening co-operative stores where the peasant could purchase on easy terms, and at the lowest possible prices, the latest types of agricultural machinery, and had further the benefit of the advice of a disinterested expert attendant. In several districts the societies have built their own flour mills for the benefit of members.

Wholesale dairy-farming on a large scale is also carried out by certain societies on behalf of their members. Another interesting operation of the societies consists in the co-operative renting of land. It was found that large tracts of land rented by a society could be obtained on much lower and better terms than would be accorded to individual peasants in respect of a few acres. Moreover, by taking large tracts, the society could introduce a satisfactory scientific rotation of crops.

The co-operative sale of agricultural produce is certainly no less important an achievement. In the old days the Russian peasant was the sport of a number of circumstances over which he had no control. He was always in debt, mostly in the hands of a usurer, and was compelled to sell his produce at a certain time; his needs were exploited, and he was thus in a vicious circle which was annually contracted by the usurer, who was often at once the capitalist and the buyer, and from whom there seemed to be no escape. The rural agricultural society has now come to his rescue. The grain is collected and sold in trucks at better prices, for middlemen and usurers are avoided, and the society can store the grain and take advantage of the market, or await better prices. In order to make this possible, mutual credit associations have been called into being, by means of which the peasant is financed and freed from the clutches of the usurer, or "fist," as he is colloquially called. The beneficent collaboration of rural agricultural societies and these mutual credit associations has been more particularly manifested in the province of Samara. On exhibiting a receipt for produce held by the stores the peasant can obtain an advance of 75 per cent. of the value of the produce. In some places where grain elevators have been erected, the Government has come to the assistance of the society and advanced the required funds on very reasonable terms.

As yet purely commercial agricultural associations are still in their infancy in Russia. Co-operative dairy-farming and the egg industry have both developed, however, and various organisations have co-operated, both the Zemstvos and the Government having assisted in the co-operative movement. There are some very interesting cases of the growth of particular organisations from small beginnings, with very modest funds, until they have gradually developed into large undertakings with considerable capital.

THE EMPIRE SETTLEMENT COMMITTEE'S REPORT.*

THE Empire Settlement Committee was appointed by the Rt. Hon. W. H. Long, M.P., Secretary of State for the Colonies, in February of this year, "to consider and report on the measures to be taken for settling within the Empire ex-soldiers who may desire to emigrate after the War; to collect

* [Cd. 8672.] London. August, 1917. Price 9*d*. net.

and prepare for distribution to intending emigrants of this class information which shall show clearly the nature of any facilities afforded by the Governments of the Dominions and States; and to make recommendations as to the steps which should be taken by His Majesty's Government in concert with the Governments of the States and Dominions for the constitution of a Central Authority to supervise and assist such emigration."

The Committee, consisting of rather more than thirty members—including the Rt. Hon. F. D. Acland, M.P., representing the Board of Agriculture and Fisheries, Mr. Clive Bridgeman, M.P., Parliamentary Secretary to the Ministry of Labour, Mr. Macpherson, Under-Secretary of State for War, Mr. G. H. Roberts, Parliamentary Secretary to the Board of Trade, and the Agents-General of the various Dominions—began work in April and completed their task at the end of July. As their numbers were rather large, with a view to facilitating the inquiry, the Committee immediately formed two Sub-Committees, a General Purposes Committee to examine into opportunities for the settlement of ex-service men in the overseas Dominions, and a second Committee to consider the provisions for agricultural settlement made to induce discharged soldiers to remain at home. The first half of the Report is concerned with the examination of these two opposing schemes.

After recording their sense of the profound change of attitude towards emigration brought about by the War, in that it has emphasised both the essential unity of the Mother Country and the Dominions and the necessity of examining our emigration system from the standpoint of the Empire as a whole, the Report proceeds to pass in review the Government schemes for agricultural settlement at home. Some account of these was given in the June number of the *Journal*.* At present the schemes are on a very small scale: in *employment*, securing only the establishment of a minimum wage of 25*s*. a week for agricultural labourers and the guarantee of a minimum price for wheat and oats from 1917-1922, and as regards *settlement*, providing, in England, for not more than 240 men or (including their wives and families) for 1.200 persons.

Oversea schemes for land-settlement fall into two categories: (1) *Settlements on Crown Lands*, and (2) *Settlements on land controlled by Private Companies*. A summary of the

* See p. 326.

Government schemes will be found in the adjoining table; as to the schemes proposed by private companies, the Committee state that they have not received much evidence about the facilities offered, and suggest that ex-service men "should not be encouraged to avail themselves of them until each offer has been carefully investigated." In the case of all grants of land for farming, fruit-growing, dairying, and so forth, whether the land is controlled by the Government or by private companies, the Report lays very great emphasis on the need for capital and experience. The capital required varies from a very small sum in the Prairie Provinces of Canada, Ontario and New Brunswick, to £1,000 or £1,500 in the Union of South Africa and Rhodesia. In some cases the land is a free grant and in most cases the payment for the land is distributed over a number of years, varying from five years in Quebec (during which time the settler must reside on his holding, build a house to be completed in the first 18 months, and clear 15 acres) to thirty years in Western Australia. Moreover, the Governments or Agricultural Credit Banks are ready to advance money for improvement at a moderate rate of interest; hence the amount of capital required is smaller than at first sight appears, and this is particularly true in the case of Canada and Australia. Still some capital is in every case almost essential. Much more indispensable, however—and on this the Committee lay most particular emphasis—is the necessity for previous agricultural experience; this should, in general, be acquired locally, either by employment on a training farm or at some similar institution or by working for a time on another man's farm. If, as appears probable, there should be few transports available for conveying emigrants to the oversea Dominions during the first few months after the War, the Committee recommend that ex-service men should employ the time of waiting by getting some knowledge of agricultural work in this country, on farms already existing or to be established by the Y.M.C.A., the Church Army, and other public bodies. The Committee further attach considerable importance to the suggestion that the Home Government should provide soldiers while they are awaiting demobilisation with instruction in carpentering, building, and so forth.

The acquiring of local "colonial experience" by intending settlers has the additional advantage of lessening the transport difficulty by necessarily postponing the emigration of wives and families. There is seldom adequate accommodation

A TABLE ILLUSTRATING GOVERNMENT SCHEMES FOR SETTLEMENT OF EX-SERVICE MEN OVERSEAS.

Dominion or State.	Extent of Individual Grant.	Conditions.	Crops.	Government Loan.	Repayment.	Whether previous experience necessary.	Training.	Capital necessary.	Other Remarks.
CANADA—									
1. Dominion Lands.	160 acres in Manitoba, Alberta, Saskatchewan.	Free	Wheat, mixed farming.	£400† maximum.	In 15 years at 5 per cent.	Yes ..	Dominion Demonstration Farms or with approved farmers.	None ..	Available also for widows of soldiers and sailors who have died on active service.
2. New Brunswick.	10-160 acres ..	Cost governed by cost of improvements (clearing, well, house).	Dairying, fruit, potatoes.	£100-£300	10 per cent. on application, balance within 20 years.	Yes ..	Demonstration Farms.	£100-£400 desirable.	Community settlements to be established, accommodating from 100 to 250 families, with church, public hall, school, etc.
3. Nova Scotia	Private farms for sale.	Cost from £120-£3,000.	Mixed farming, fruit, dairying, stock-raising.	Up to £500	Secured by mortgage.	Advisable.	Employment on Farms.	£300 necessary.	Government will assist in choice of farm and employment in order to gain experience.
4. Quebec ..	Land offered in lots of 100 acres.	£6 per acre, payment within five years.	Heavily timbered land.	—	—	Yes ..	—	—	Suitable only for native-born Canadians. Within 5 years settler must clear 15 acres, build house and put up a barn.
5. Ontario ..	160 acres ..	Free, subject to conditions as to cleaning, cultivation and residence.	Root crops and hay.	£100 ..	In 10 years at 6 per cent.	Yes ..	Demonstration Farm at Monteith.	Not absolutely essential	Men without experience will be trained at Monteith Experimental Farm at a reasonable wage; and subsequently a farm colony will be established along one of the railways.*
6. British Columbia.	Not yet fixed ..	Pre-emption claim to land purchasable for £2.	Timbered. Fruit crops, mixed farming.	A fund to be provided.	—	—	—	—	—
AUSTRALIA—									
1. New South Wales.	From 2 to 250 acres, average size, 50 acres.	Rental 2½ per cent. of capital value.	Fruit, dairying, and mixed farming.	¾ of holder's interest.	When land becomes productive.	Yes ..	Govt. Farm at Griffith.	£50-£100 desirable.	—

* For further details, see *Journal*, July, 1917, p. 452.

† The Dominion Government has also announced its intention of giving financial assistance to any approved settler on other than Dominion Lands in any province of the Confederation.

Dominion or State.	Extent of Individual Grant.	Conditions.	Crops.	Government Loan.	Repayment.	Whether previous experience necessary.	Training.	Capital necessary.	Other Remarks.
AUSTRALIA—									
2. Victoria ..	Not fixed; land chiefly in irrigation areas.	3 per cent. deposit of capital value. 6 per cent. per annum for 31½ years.	—	£500 maximum	Long period on easy terms.	Yes ..	Agricultural College at Dookie.	At least £300	—
3. Queensland	10-1,280 acres	Rent 1½ per cent. of capital value (average 25s. per acre)	Poultry farms, fruit, mixed farming.	£500 ..	Within 40 years at increasing rate of interest.		Training farms to be established.	—	No deposit and no rent for first three years. 60,000 acres already set apart and further acres as required and after construction of railways.
4. South Australia.	From a few acres upwards.	—	Wheat, fruit and grazing, acc. to dist.	Liberal advances promised	On easy terms	Yes ..	Farms comprising similar land.	Some capital desirable in all cases.	Two large blocks of land N. of Adelaide, Mount Remarkable and Mount Crawford Estates set apart, suitable for wheat and grazing.
5. Western Australia.	(i.) From 160 acres. (ii.) 160 acres..	(i.) Payment of survey fee and up to 840 acres at 15s. per acre. (ii.) Same terms.	(i.) Wheat. (ii.) Fruit-growing, intensive cultivation	Loan from Agricultural Bank.	—	Yes ..	Depots to be established at each settlement.	Some capital desirable.	Men can usually find employment on arrival and support themselves while acquiring experience.
6. Tasmania ..	From 200 acres, according to class of land.	Men must have been previously resident in Tasmania. By purchase or on lease.	Mixed farming, fruit, mostly timbered.	£300 ..	Within 4 years	Some experience necessary	State Farm at Deloraine.	—	—
NEW ZEALAND ..	Provisions apply only to officers and men of the New Zealand forces and residents who have served in other Contingents.								
UNION OF SOUTH AFRICA ..	A limited scheme to be framed.	Openings for settlers who will take up undeveloped irrigation holdings.	—	—	—	Indispensable.	Preliminary training on the spot.	£1,000 ..	Presence of native labour makes immigration of unskilled labour impracticable.
NEWFOUNDLAND	No special scheme at present.	—	—	—	—	—	—	—	Main industries depend upon the fisheries, forests, and mines. Farming usually combined with some other occupation.
RHODESIA ..	British S. Africa Co. offers 500,000 acres.	Practically free of rent to men with requisite capital.	Ranching; some crops.		—	—	Locally ..	About £1,000	Some knowledge of horses, live-stock, and handicrafts valuable. Openings for men who can direct the labour of others.

for married labourers on farms abroad, and the pay which a man receives whilst under training is not large. Moreover, a man who has been in a State or Dominion for a short period can, in some cases, obtain reduced passages for his wife and family. The whole question of female emigration is, the Committee believes, most important and the essential foundation of all effective Empire settlement. In the case of widows and orphans, women relatives and fiancées of ex-service men, women agricultural and munition workers and others displaced at the end of the War, better openings will be available overseas than any which they could secure at home, and the Committee add that, in their view, there would be far greater justification for the grant of monetary assistance towards the emigration of the wives, families, and other relatives of ex-service men than there would be for such assistance towards the emigration of the men themselves. In all cases, however, the oversea Governments concerned would have to be satisfied that the proposed immigrant is one whom they would welcome.

The second half of the Report is concerned with suggestions for putting the information about agricultural openings within the reach of all service men; it also investigates the question of transport and the question of finance, and outlines the constitution of a central Emigration Authority to be created without delay.

The Committee close their Report with the confidence that the generous action of the Dominions in placing the men from home on the same footing as their own men in land settlement will tend still further to the consolidation of the Empire.

THE following Notes have been communicated to the Board by Professor Leplae, and Messrs. Van Orshoven and Vendelmans :—

Intercropping and Catch Cropping in Belgium.

Intercropping and catch cropping are special features of Flemish agriculture, as distinct from the practice in the Walloon provinces, and are largely practised on the light fertile soils of Flanders and Brabant, where a first crop can be harvested sufficiently early in the year to allow the second crop to mature before the winter.

Catch Cropping.—On the larger farms, catch crops are more generally grown than intercrops, or in other words the land is usually cleared of one crop before the next is sown.

The catch crops used in Belgium are as follows :—

Time of Seeding.	*Crop.*
March—April	Red clover in corn.
June—July	Turnips after flax.
July	Turnips after rye or barley.
	Spurrey after rye.
July to August	Lupins for ploughing in.
August to September ..	Italian rye-grass (for spring fodder)
	Crimson clover ,, ,,
	Green rye ,, ,,

Turnips are much the most important catch-crop in Belgium. A quick-growing variety is required, such as Pomeranian White or Long Alsatian, and they are sown as early as possible, in fact often before the corn is carried. The seed is drilled on the fresh furrow, if possible the same day as the land has been ploughed, and the land is dressed with nitrate of soda and superphosphate. A valuable fodder is obtained in early winter and forms the staple food of milch cows until January, when it is replaced by mangolds.

Spurrey is a typical light-land crop. The rye stubble is broken up, and 15 to 20 lb. of seed are sown broadcast, giving some 4½ tons of green fodder in about 7 weeks. It is said to communicate a remarkably fine flavour to butter.

Belgian farmers generally reckon that a catch crop may be grown every other year, and thus increase the crop area of their farms by 30 to 50 per cent. Such a system of continuous cropping, however, can only be maintained with heavy manuring ; farmyard manure is applied every second year, liquid manure and some artificials nearly every year.

A typical rotation with its manurial dressings is given below :—

	Farmyard Manure. Tons.	*Nitrate of Soda. cwt.*	*Super-phosphate.* cwt.*	*Muriate of Potash. cwt.*
1st year :—				
Chicory sown April to May, dug in October, 12 tons of roots per acre	10–12	2½	5	—
2nd year :—				
Flax, harvested in June and followed by turnips fed in autumn and winter	—	1	—	—
	—	1	1½	—
3rd year :—				
White haricot beans ..	10	—	5	—
4th year :—				
Rye followed by turnips or carrots	—	1½	—	2

* On the lighter soils, basic slag is preferred to superphosphate, the quantities being increased by about 50 per cent.

	Farmyard Manure, Tons.	*Nitrate of Soda, cwt.*	*Super-phosphate,* cwt.*	*Muriate of Potash, cwt.*
5th year :—				
Potatoes	10	2	5	—
6th year :—				
Rye, followed by turnips or carrots ..	—	1	—	—
7th year :—				
Large sugar mangolds yielding 30 tons per acre	10–12	2½	5–6	2
8th year :—				
Winter barley in which clover is sown in spring. Barley is cut in June and clover gives one cut ..	—	1½	—	—
9th year :—				
Clover, 2 cuttings; turf ploughed under ..	—	—	—	—
10th year :—				
Early oats, followed by rye, crimson clover or Italian rye-grass sown end of August, followed by chicory ..	—	1½	2	—

Intercropping.—In the market-garden districts of Malines and Louvain intercropping is extensively practised, especially where the soils are light enough not to pack hard with treading. Typical associations are given below :—

1. Early cabbage or cauliflower intersown with spinach or cabbage lettuce, or with radishes and lettuce.
2. Carrots interplanted with cabbage, lettuce, or scorzonera.
3. Early potatoes intersown with radishes, which are cropped before the potatoes are earthed up.
4. Late cabbage interplanted with an early variety, which is marketed before the main crop attains full size.

In a general way it may be said that all vegetables which occupy the soil for some time are intercropped with spinach, early carrots, radishes, chervil or lettuce.

Where early peas are grown in beds carrots are sown among the peas, and occupy the ground after the latter crop has been harvested. Peas are often planted in every third or fourth row of a potato crop ; a single pea of a dwarf variety is pressed down in the centre of each potato plant ; the pea grows up with the potato, and when the pods are ripe it is pulled up bodily. The practice, however, cannot be recommended with green peas, as too much treading of the soil then takes place in picking the crop. Cabbages or Brussels sprouts are sometimes planted between all but the very late varieties of potatoes.

* On the lighter soils, basic slag is preferred to superphosphate, the quantities being increased by about 50 per cent.

They are planted in the furrows after the potatoes have been earthed up and do not in any way interfere with the growth of the potatoes.

Though intercrops are typical of intensive rather than extensive cultivation, the two following crop associations are commonly met with on the larger farms in the sandy (old heather) districts of Northern Belgium :—

1. *Carrots in Corn.*—Carrot seed is broadcasted in wheat, rye, or winter barley in February or March. The rate of seeding is about one-third heavier than when the crop is drilled in the ordinary way, and no attempt is made to cover the seed; but the soil is kept comparatively moist by the shade of the corn and germination is generally satisfactory. By the time the corn is ripe, the carrots have usually made sufficient growth to get the tips of their leaves cut when the corn is harvested, but no appreciable damage is done. After harvest the ground is harrowed and the carrots are lifted about the end of November. An Intermediate carrot is grown and it is used for stock feeding, but there is no reason why a horticultural variety should not be equally successful.

2. *Serradella in Corn.*—On very light land serradella seed is broadcasted in April and in a corn crop at the rate of 25 lb. per acre. It is harrowed in and gives a good crop of green fodder for grazing and cutting in autumn, but is killed by severe frosts during the winter.

Maintenance of Supplies of Hay and other Fodder Crops.*

THE ploughing up of grass land during the coming autumn and winter will necessarily reduce the area available for hay and pasturage in 1918. An endeavour should be made to compensate for the ploughing of meadow land by growing hay on land which has hitherto been depastured, but in many cases this will not be possible, and in view of the necessity of maintaining the fodder supply of the country, special measures must be taken by many farmers to provide for the winter of 1918-19. The following suggestions are made with the object of safeguarding the fodder supply :—

1. During the coming winter (1917-1918) the greatest possible economy should be exercised in the use of both hay and straw wherever possible; straw should be used instead of hay for feeding purposes, and material such as bracken, peat moss, or sawdust should be used for bedding. (See Special Leaflet, No. 38.)

* Food Production Leaflet No. 7.

2. It is expected that the area of rotation grass in 1918 will be less than that of previous years, and it will therefore be necessary to save a larger proportion of permanent grass for hay than usual. The reduction in the area might, to some extent, be balanced by the greater production per acre which could be secured from much of the remaining grass land (both pasture and meadow) by suitable manuring.

3. Though the essential thing is to produce from the arable land direct human food—grain and potatoes—some of it may be set aside for the production of fodder crops for stock. For example, the farmer who is able to plough 20 acres of grass land to add to his acreage under corn may be able, despite the shortage of labour, manures, etc., to borrow a little more from the grass land on which to grow forage crops to replace the hay and grass which he is losing. Dairy farmers, again, can reduce their demand for purchased foods if they will replace a little of their grass by arable land, with its greater productive capacity. On many such farms an increase in the area of arable land could be made without throwing an impossible burden on the existing staff of men and horses, thus enabling the farm to contribute to the national supply of grain without reducing the total quantity of home-grown forage.

Vetch Mixture Hay.—One of the most useful crops for the object in view is vetch hay which, if sown in early autumn, will be ready for mowing in most parts of the country not later than the end of June, in time to allow of a subsequent crop of cabbages, turnips or rape, or at worst a half-fallow in preparation for autumn-sown wheat. It is recommended that wherever possible such a crop should be taken on part of the land intended for roots in 1918 and that a certain area be taken after old grass. In order to keep the vetches off the ground, and facilitate cutting, it is advisable to sow some winter oats, or barley, with the vetches. A suitable mixture for sowing under average conditions would be : 1 bush. of winter vetches, 1½ bush. of winter oats and 1 bush. of winter barley. If available, ½ bush. of beans might be substituted for part of the cereals. In order to secure the best results the ground should be clean and in good heart, but rather than lose time in cleaning the ground it is better to give a little nitrogenous manure in early spring in order to induce a sufficiently strong growth of crop to keep down weeds. The subsequent root

crop or half-fallow will give a good opportunity of dealing with weeds. It is important to get the vetch crop well established before winter sets in. If sown in September or early October the crop should be fit to cut by about the middle of the following June. Judgment is needed in deciding when to cut the crop. If cut too young, the vetch leaves wilt and fall to dust; if left uncut too long, the crop becomes fibrous and stock refuse it. The right time to cut is when the seeds in the pods at the base of the plant are about half-formed. The method of harvesting the vetch mixture is precisely the same as in the case of "seeds" hay.

As soon as possible after the vetch mixture has been cleared, the soil should be ploughed, but if, as will frequently be the case, other work of the farm makes it impossible to plough at once, a preliminary cultivating or discing should be given in order to kill weeds and prevent the surface becoming too hard and dry for ploughing later.

As an illustration of the way in which it is possible to combine the two objects of increased corn production and maintenance of dairy stock, the following definite case may be considered:

A diary farm of 100 acres (50 pasture, 30 meadow, 20 arable) at present maintains 30 cows, a team of horses, and a few young stock. The arable land is farmed on a 4-course rotation, there being 10 acres corn, 5 acres green crop and 5 acres clover and rye-grass (mown for hay).

The total production of food may be estimated to be as follows:—

Summer—			
Grazing of 50 acres Pasture.			
,, 30 ,, Aftermath.			
Cabbage and Maize from 1 acre for use on pastures.			
Winter—			
Hay from 30 acres Old Meadow	say 45 tons.		
,, 5 ,, Clover, 1st crop ..	,, 10 ,,		
,, 5 ,, Clover, 2nd crop ..	,, 5 ,,		
	—	60 tons.	
Straw from 10 acres Corn	,, 15 ,,		
Less—used for thatching, bedding, etc.	,, 5 ,,		
	—	10 ,,	
Roots from 2 acres Mangolds	40 ,,		
,, 2 ,, Swedes and Turnips ..	,, 30 ,,		
	—	70 ,,	
"Seconds" or "Tail Corn" from 10 acres	,,	1 ton.	

If the area of arable land were doubled by ploughing up an additional 20 acres of grass, and part of the root-break

cropped as indicated on p. 650, the cropping of the farm might be altered to the following :—

Pasture	45 acres.
Old Meadow	15 ,,
Corn	20 ,,
Clover and Rye-grass	10 ,,
Mangolds	4 ,,
Swedes	1 acre.
Vetches, followed by Maize, Cabbage and Turnips or Rape	5 acres.

In this case the total production of food which might be expected would be as follows :—

Summer—

Grazing of 45 acres Pasture.
,, 15 ,, Old Grass Aftermath.
,, 10 ,, Clover and Rye-grass Aftermath.
Vetches from 1 acre.
Cabbage and Maize from 2 acres.

Winter—

Hay from 15 acres Old Meadow	say 22½ tons.	
,, 10 ,, Clover, 1st crop	,, 20 ,,	
Vetch Hay from 4 acres	,, 10 ,,	
	—	52½ tons.
Straw from 20 acres Corn	,, 30 ,,	
Less—used for thatching, bedding, etc.	,, 8 ,,	
	—	22 ,,
Roots from 4 acres Mangolds	,, 80 ,,	
,, 1 acre Swedes	,, 18 ,,	
,, 3 acres Turnips, etc.	,, 36 ,,	
	—	134 ,,
"Seconds" or "Tail Corn" from 20 acres	,,	2 ,,

It will be admitted that the supply of food grown under the second system of cropping is at least as great as that grown under the first ; no reduction in stock or extra purchase of food would be necessary, although the production of grain for sale has been doubled.

The above statements apply to the system when the 20 acres of new arable land have been brought into the rotation and the system is well established. The transition period is naturally the most difficult time, but with care there need not be even a temporary reduction of stock.

For instance, if, for 1918, 15 acres of the grass land are broken up—5 in time for the autumn sowing of vetches and oats—the arable cropping for 1918 might be

20 acres Corn.
5 ,, Clover and Rye-grass.
5 ,, Mangolds and Swedes.
5 ,, Vetches, followed by Maize, Cabbage, and White Turnips or Rape.

If next year the remaining 5 acres of grass were brought under the plough and a double area of vetch hay were taken the cropping for 1919 would be :—

20 acres Corn.
5 „ Clover and Rye-grass.
5 „ Vetch Hay, followed by half-fallow.
5 „ Mangolds and Swedes.
5 „ Vetches, followed by Maize, Cabbage, etc.

In 1920 the cropping would be the rotation set out on p. 652.

"Black-Leg" or Black Stem-Rot of Potatoes.

ALTHOUGH not so widely recognised as it should be, "black-leg" of potatoes (*Bacillus phytophthorus* or allied species) is a common disease in Britain. It is well known on the continent of Europe, where it was first studied in detail, and it is to be found in practically every country where the potato is cultivated. The losses caused by black-leg are often not regarded as serious, since the disease is not epidemic in character as is the ordinary potato blight (see Leaflet No. 23). Nevertheless, the losses in the aggregate reach in an average season a considerable amount, and in unfavourable and wet seasons they may be really severe.

The disease is caused by bacteria ; and although the parasitic organisms found in the various countries in which the disease has been investigated show certain differences and have received different names, yet recent researches tend to show that most of the organisms described are, if not actually identical, very closely related. For practical purposes the disease may be regarded as being caused by the same species of bacterium.

Symptoms of the Disease.—Black-leg is one of the earliest potato diseases to show itself. Affected plants may be seen as early as the middle of June, but they may continue to make their appearance till considerably later. Diseased plants are somewhat stunted, and are conspicuous even at a distance by their pale green or yellow foliage. The upper leaves show a tendency to remain small, stiff, and erect, whilst the margins of the leaflets are generally rolled inwards.

The most characteristic feature is to be found at the base of the stem. If affected stalks are pulled up they will be noticed to come away easily and to be rotten and inky black at their bases (see illustration). In some plants all the stalks will be affected in this way, in others only one or two. The outer or cortical tissues will be soft and decayed or perhaps entirely rotted away, and if cut open the pith will be found to

be blackened or destroyed. In some cases the destruction of the pith extends upwards for a considerable distance. The old " set " or " seed " potato will be completely rotted away.

Another indication of black-leg is seen when affected stems are cut transversely. The section will show near its outer part three brown spots which are the woody portions of the principal vascular bundles. The brown colour is due to the action of the bacteria, and in bad cases it extends to the extreme apex of the shoot and sometimes manifests itself externally in the form of black streaks on the stem. If such vascular bundles are examined with the microscope, the tissues, at any rate in the most recently-affected portions, will be found to be teeming with bacteria. It will be noted also that affected stems are tougher than those which are healthy. These two features—the discoloured bundles and the tough stems—are not, however, confined to black-leg, but occur also in " leaf-roll " and in certain wilt diseases.

Later Stages of the Disease.—As the season advances the leaves of affected plants turn brown and the stalks usually die off. If the disease develops early this will take place before any new tubers are produced, but where the disease may have progressed more slowly new tubers will have been formed, and a certain number of these will be affected, the parasitic organism having passed along the rhizomes (or underground stems) and entered in at the heel-end.

Diseased tubers may be recognised by being soft and discoloured, especially at the heel-end, and by the flesh being brown and ultimately becoming wet and rotten. In bad attacks practically all the tubers decay in the ground, but in many cases the disease does not advance so rapidly, and the tubers remain sound for a time but decay badly in storage. Those tubers which are only slightly affected survive the winter and if planted give rise to diseased plants.

Decay in the store is probably also increased by infection of healthy tubers through contact with those which are diseased. The soft, wet mass formed in the rotting diseased tubers contains millions of the parasitic bacteria, and it has been proved by experiment that water containing these bacteria is capable of infecting and causing the decay of sound tubers The parasite in this case enters by way of the lenticels (or breathing pores) and probably also by means of wounds. The heavy losses which occasionally occur in the pit are perhaps largely attributable to this form of infection, especially if the pit is wet or badly ventilated.

Spread of the Disease.—It has been proved beyond all question that black-leg is propagated by the use of diseased "seed." The seed may sometimes be so slightly infected as to appear quite sound externally, yet if planted it may produce diseased



Black-leg of Potatoes : attacked stem and diseased tubers.

plants. The greatest care, therefore, should be exercised that none of the progeny of diseased plants be saved for planting purposes. It should be remembered that tuber-infection is liable to take place, not only when plants are so badly attacked

that they die, but when only one or two shoots are affected and the plants as a whole continue to live.

Land which has borne a diseased crop will be certain to contain the parasitic bacteria in more or less abundance, and it is probable that such soil will be capable of producing disease in a new crop even though planted with healthy tubers. Direct infection of the young tubers from the soil has not, however, been definitely proved for this country, though it is stated to take place on the Continent. Tubers from infected land would moreover be contaminated owing to the soil adhering to them, and might be suspected of giving rise to a diseased crop or of carrying infection to new localities. In England no evidence has yet been advanced to prove that black-leg is seriously increased by this means, but, in the event of it being proved, it has been shown in America that the seed tubers may be easily disinfected with formalin.

Almost all varieties of potatoes are subject to black-leg, but it is perhaps especially common in British Queen, Great Scot, and King Edward.

Control.—1. As far as is practicable all diseased plants should be dug up and destroyed as soon as noticed, and the young tubers removed from the soil. Tubers which are sound may be used for immediate consumption. The remainder should be destroyed.

2. It is of the utmost importance to use only sound seed. Tubers which are the produce of affected plants, however sound they may appear to be, should never be saved for seed purposes. If possible, seed should be obtained only from areas where black-leg is not prevalent.

3. Care should be exercised in constructing the pits. All tubers showing any trace of disease should be excluded, and the pits made as dry and well ventilated as possible.

4. Though it has not been proved that in this country disease is contracted from the soil, infected land should not be planted with potatoes for, at the least, one year.

Notes on Feeding Stuffs for October: *From the Animal Nutrition Institute, Cambridge University.*

SUPPLIES of feeding stuffs are on the whole small. Many well-known articles have practically disappeared from the market. There is still a fair supply, however, of English linseed cake, Egyptian cotton cake, palm kernel cake, maize, and wheat offals on most markets.

Changes in price since last month have been very irregular. On the whole, there has been a slight tendency in the direction of reduced prices, but, on the other hand, several important articles (*e.g.*, wheat offals) are distinctly dearer. Feeding barley, in spite of the very small supply, fell greatly in price, no doubt in view of the large amount of damaged barley which may be expected to result from the unsettled weather during harvest.

It is difficult to discuss the prices of cakes and offals whilst Lord Rhondda's decision as to reducing their prices is still pending, and whilst there is some uncertainty as to the amount of cake which is likely to be available.

Horses.—Nothing has happened since last month to necessitate any change in the ration then suggested for horses, namely, a mixture of 4 lb. of palm kernel cake with either 5 lb. of pollards or 7 lb. of bran, which might be used to replace 10 lb. of oats. Probably, however, many farmers will prefer to use their own oats as soon as they begin thrashing.

Milking Cows.—The recent wet weather will have resulted in a large supply of grass of a lush character, which will be liable to cause scouring unless counteracted by a certain allowance of dry food. Cotton cake is the best known food for this purpose, and it may be advisable to use 2 lb. or so per head per day, although the present price of about £16 per ton works out at the very high figure of 4*s.* 6*d.* per unit.

Bran fed dry is also useful for preventing scouring, and at present prices is 1*s.* per unit cheaper than cotton cake.

For purposes other than the above, the cheapest and most plentiful foods suitable for cows are palm kernel cake and millers' offals.

It is impossible at present to discuss winter feeding until the Food Controller has stated what measure of success he has been able to achieve in reducing the prices of cakes and offals, and what arrangements he proposes for ensuring the supply of dry food for the production of winter milk.

TABLE I.

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of August.													
		London.		Liverpool.		Hull.		Bristol.		Glasgow.		Leith.			
		Price.	Supply.	Price.	Supply.	Price.	Supply.	Price.	Supply.	Price.		Price.			
		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.		£ s. d.			
Soya Bean Cake	122·3	—	None	—	—	—	None	—	—	—		—			
Decorticated Cotton Cake	126·3	22 5 0	Very small.	21 12 6	Moderate	—	None	—	—	—		—			
Decorticated Cotton Meal	126·3	—	—	—	—	—	—	—	—	—		—			
American Linseed Cake	119·0	—	—	—	—	—	—	—	—	—		—			
Indian Linseed Cake	123·1	—	None	21 15 0	Moderate	—	None	—	—	21 10 0		21 10 0			
Russian Linseed Cake	123·5	—	—	—	—	—	—	—	—	—		—			
English Linseed Cake	120·1	22 0 0	Fair	—	Limited	—	—	20 0 0	Small	—		21 15 0			
Bombay Cotton Cake	65·3	—	None	16 5 0	Moderate	—	None	15 5 0	Small	—		16 5 0			
Egyptian Cotton Cake	71·9	16 0 0	Fair	16 15 0	,,	15 10 0	Fair	15 15 0	Small	—		16 5 0			
Coconut Cake	102·6	18 0 0	,,	—	—	—	None	—	—	—		—			
Palm Kernel Cake	96·1	16 10 0	,,	15 0 0	Fair	14 12 6	Poor	—	—	—		—			
Palm Kernel Meal (extracted)	92·5	—	—	—	—	—	—	—	—	—		—			
Ground-nut Cake	145·2	18 10 0	Improved	—	—	—	None	—	—	—		—			
English Beans	99·5	21 9 6	Some still left.	22 12 9	Moderate	21 1 0	Poor	—	—	—		—			
Bean Meal	99·5	—	—	—	—	—	—	—	—	25 0 0		—			
Chinese Beans	101·1	—	—	21 14 0	Fair	—	None	—	—	—		—			
English Maple Peas	97·2	24 0 0	Some still left.	—	—	29 6 8	Poor	—	—	—		—			
English Dun Peas	97·2	22 17 9	,,	—	—	26 13 4	,,	—	—	—		—			
Calcutta White Peas	97·5	—	Nominal	—	—	—	None	—	—	—		—			
American Maize	93·8	16 6 8	Fair	17 0 9	Poor	16 17 3	Fair	—	—	} 19 4 0		—			
Argentine Maize	94·2	17 10 0	Small	19 15 9	Poor	—	None	—	—			—			
Maize Meal	86·5	*22 15 0	Scarce	—	—	36 5 0	Poor	—	—	20 0 0		—			
Maize Gluten Feed	121·6	19 0 0	,,	17 15 0	Good	—	None	19 0 0	Fair	—		—			

* No inferior offered.

TABLE I.—*continued.*

Feeding Stuff.	Digestible Food Units.	Approximate Prices per ton at the end of August.													
		London.		Liverpool.		Hull.		Bristol.		Glasgow.		Leith.			
		Price.	Supply.	Price.	Supply.	Price.	Supply.	Price.	Supply	Price		Price.			
		£ s. d.		£ s. d.		£ s. d.		£ s d.		£ s. d.		£ s. d.			
Maize Germ Meal	99·2	19 5 0	Scarce	19 0 0	Good	—	None	18 17 6	Small	—		—			
English Feeding Barley	83·0	—	None	—	—	15 8 0	Poor	—	—	—		—			
English Oats	75·4	—	,,	—	—	19 15 0	,,	‡23 6 8	Small	—		—			
Argentine Oats	75·4	22 9 6	Scarce	—	—	—	None	—	—	—		—			
Malt Culms	69·9	15 0 0	Variable	—	—	13 10 0	Poor	—	—	14 10 0		15 10 0			
Brewers' Grains (dried)	84·5	18 0 0	Improved	—	—	16 0 0	,,	17 15 0	Fair	16 15 0		—			
Brewers' Grains (wet)	21·1	2 12 6	,,	—	—	2 0 0	,,	—	—	—		—			
Distillers' Grains (English)	101·2	19 0 0	Moderate	—	—	—	None	18 10 0	Fair	} 17 0 0		16 15 0			
Distillers' Grains (French)	101·2	19 0 0	Fair	—	—	—	,,	—	—			—			
Distillers' Mixed Grains (wet)	20·0	—	—	—	—	—	—	—	—	—		—			
Egyptian Rice Meal	78·7	—	Nominal	—	—	—	None	—	—	—		—			
Burmese Rice Meal	78·7	—	,,	—	—	—	,,	—	—	—		—			
Rice Bran	78·7	—	—	—	—	—	—	—	—	—		—			
Wheat Middlings (coarse)	92·0	15 0 0	Scarce	—	—	14 15 0	Fair	—	—	15 10 0		15 5 0			
Wheat Sharps	92·0	15 5 0	Very Scarce.	15 5 0	Limited	14 15 0	Fair	15 0 0	Fair	14 15 0		14 0 0			
Wheat Pollards	87·0	—	—	14 7 6	,,	—	—	—	—	—		—			
Wheat Bran	77·5	13 0 0	Scarce	—	—	14 0 0	Fair	13 10 0	Good	14 2 6		13 15 0			
Wheat Bran (broad)	79·9	14 0 0	,,	14 10 0	Limited	15 10 0	,,	14 0 0	,,	14 5 0		14 14 0			
Feeding Treacle	60·0	—	None	22 10 0	Moderate	—	None	—	—	—		—			
Linseed	153·5	30 0 0	Fair	—	—	30 0 0	Poor	32 0 0	Small	—		¶32 10 0			
Linseed Oil	250·0	58 0 0	,,	†62 0 0	Limited	60 0 0	,,	58. per gal.	,,	—		—			
Egyptian Cotton Seed	108·6	19 0 0	,,	—	—	19 0 0	,,	—	—	—		—			
Bombay Cotton Seed	99·6	—	—	—	—	—	—	—	—	—		—			
Cotton Seed Oil	250·0	60 0 0	Fair	†75 0 0	Limited	—	—	—	—	—		—			
Fish Meal	145·0	—	—	—	—	—	—	—	—	17 0 0		17 0 0			

† In barrels. ‡ Old crushed. ¶ Crushed.

Cattle for Beef Production.—It is extremely difficult to give definite advice on this subject under the present conditions of uncertainty as to the supply and price of feeding stuffs. The only possible line to take is to assume that the supply of feeding stuffs for beef production in the coming winter will be extremely limited, and that for the most part cattle will have to rely on little more than roots, hay, and straw, helped by a minimum of cake and possibly a small allowance of home-grown oats.

Under these conditions, young cattle will not make such progress as will fit them for slaughter in the spring. They must be wintered as cheaply as possible and fattened on the grass next summer.

In the case of older cattle, say 2½ years and over, the position is more hopeful. There is not much recent information on the production of beef by feeding on hay, straw and roots only, but the following instances, in which a minimum of cake was used, throw some light on the subject :—

In the winter of 1908–9 an investigation of the relative value of rich and poor farmyard manure was commenced at the Norfolk Agricultural Station. The 10 bullocks selected to make the poor manure were cross-bred shorthorns, about 2½ years old, weighing 10½ cwt. each, live weight. They cost £14 14*s.* per head, or 28*s.* per live cwt. Their ration per head per day was 150 lb. of roots, 7 lb. of oat straw chaff, and just under 1 lb. of undecorticated cotton cake, and they had a daily allowance of 24 lb. of barley straw for litter from which no doubt they picked out and ate the more nutritious parts. During 20 weeks on this ration, they increased in live weight 1¼ cwt. per head, or almost exactly 1 lb. per head per day. At the end of this period they were sold by auction and realized £20 5*s.* per head, or 34*s.* 6*d.* per live cwt.

This investigation has been repeated several times at Cambridge, again with the object of making poor farmyard manure for experimental purposes. On each occasion a ration similar to that quoted above has given a live weight increase averaging over 1 lb. per head per day. On one occasion the animals so fed were sold to a high-class local butcher, who reported that the yield of carcass obtained was 55½ per cent. of the fasted live weight, and that the quality of the meat was quite acceptable to his customers.

In support of these figures, it is recorded by McCulloch, in the Journal of the Highland and Agricultural Society for 1852–3, that six Galloway bullocks, between 2 and 3 years old, made

increases of 1½ lb. per head per day on a ration of 7 lb. of oat straw and 120 to 150 lb. of roots.

These instances serve to show that it is not impossible to produce eatable beef in the winter on roots and straw, especially if helped with even so small a ration of cake as 1 lb. per head per day, at any rate in the case of cattle over two years old.

TABLE II.

LONDON. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	5¾	Distillers' grains (English)	3	9
Ground nut cake ..	2	6½	Distillers' grains (French)	3	9
Maize gluten feed ..	3	1¾	Maize germ meal ..	3	10½
Wheat middlings ..	3	3¼	Linseed	3	11
Wheat sharps	3	3¾	Brewers' grains (dried)	4	3¼
Wheat bran	3	4¼	Malt culms	4	3½
Palm nut cake	3	5¼	English beans	4	3½
American maize ..	3	5¾	Egyptian cotton cake ..	4	5½
Decorticated cotton cake	3	6	Linseed oil	4	7¾
Coconut cake	3	6	English dun peas ..	4	8½
Wheat bran (broad) ..	3	6	Cotton seed oil	4	9½
Egyptian cotton seed ..	3	6	English maple peas ..	4	11¼
English linseed cake ..	3	8	Maize meal	5	3
Argentine maize.. ..	3	8½	Argentine oats	5	11½

TABLE III.

LIVERPOOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	2	11¼	Argentine maize.. ..	4	2½
Palm nut cake	3	1½	Chinese beans	4	3½
Wheat pollards	3	3½	English beans	4	6½
Wheat sharps	3	3¾	Egyptian cotton cake ..	4	8
Decorticated cotton cake	3	5	Linseed oil	4	11½
Indian linseed cake ..	3	6½	Bombay cotton cake ..	4	11¾
American maize ..	3	7½	Cotton seed oil	6	0
Wheat bran (broad) ..	3	7¾	Feeding treacle	7	6
Maize germ meal ..	3	10			

TABLE IV.

HULL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Brewers' grains (wet) ..	1	10¾	Wheat bran (broad) ..	3	10½
Palm nut cake	3	0½	Malt culms	3	10½
Wheat middlings ..	3	2½	Linseed	3	11
Wheat sharps	3	2½	English beans	4	2¾
English linseed cake ..	3	3½	Egyptian cotton cake ..	4	3¾
Egyptian cotton seed ..	3	6	Linseed oil	4	9½
American maize ..	3	7¼	English oats	5	2¾
Wheat bran	3	7½	English dun peas ..	5	6
English feeding barley ..	3	8¾	English maple peas ..	6	0¼
Brewers' grains (dried) ..	3	9½	Maize meal	8	4¾

TABLE V.

BRISTOL. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Maize gluten feed ..	3	1¾	Maize germ meal ..	3	9½
Wheat sharps	3	3	Linseed	4	2¼
English linseed cake ..	3	4	Brewers' grains (dried) ..	4	2½
Wheat bran	3	5¾	Egyptian cotton cake ..	4	4½
Wheat bran (broad) ..	3	6	Bombay cotton cake ..	4	8
Distillers' grains (English)	3	8	English oats (old crushed)	6	2¼

TABLE VI.

AVERAGE PRICES PER FOOD UNIT.
LONDON, LIVERPOOL, HULL AND BRISTOL.

	s.	d.		s.	d.
Brewers' grains (wet) ..	2	2¼	Maize germ meal ..	3	10
Ground nut cake ..	2	6½	Argentine maize.. ..	3	11½
Maize gluten feed ..	3	1	Linseed	4	0
Palm nut cake	3	2½	Malt culms	4	1
Wheat middlings ..	3	3	Brewers' grains (dried) ..	4	1
Wheat sharps	3	3¼	Chinese beans	4	3½
Wheat pollards	3	3½	English beans	4	4
English linseed cake ..	3	5	Egyptian cotton cake ..	4	5½
Decorticated cotton cake	3	5½	Bombay cotton cake ..	4	10
Wheat bran	3	5¾	Linseed oil	4	10
Coconut cake	3	6	English dun peas ..	5	1¼
Egyptian cotton seed ..	3	6	Cotton seed oil	5	4¾
Indian linseed cake ..	3	6½	English maple peas ..	5	5¾
American maize ..	3	6¾	English oats	5	8½
Wheat bran (broad) ..	3	7½	Argentine oats	5	11½
Distillers' grains (English)	3	8½	Maize meal	6	10
English feeding barley ..	3	8¾	Feeding treacle	7	6
Distillers' grains (French)	3	9			

TABLE VII.

GLASGOW. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	4	Wheat bran	3	7¾
Wheat sharps	3	2½	Brewers' grains (dried)	3	11¾
Distillery mixed grains (dried)	3	4½	Maize	4	1
Wheat middlings ..	3	4½	Malt culms	4	2
Indian linseed cake ..	3	6	Maize meal	4	7½
Wheat bran (broad) ..	3	6¾	Bean meal	5	0¼

TABLE VIII.

LEITH. PRICES PER FOOD UNIT.

	s.	d.		s.	d.
Fish meal	2	4	English linseed cake ..	3	7½
Wheat sharps	3	0½	Wheat bran (broad) ..	3	8¼
Distiller mixed grains (dried)	3	3¾	Linseed (crushed) ..	4	3
Wheat middlings ..	3	4	Malt culms	4	5¼
Indian linseed cake ..	3	6	Egyptian cotton cake ..	4	6¼
Wheat bran	3	6½	Bombay cotton cake ..	4	11¾

TABLE IX.

AVERAGE PRICES PER FOOD UNIT.
GLASGOW AND LEITH.

	s.	d.		s.	d.
Fish meal	2	4	Brewers' grains (dried) ..	3	11¾
Wheat sharps	3	1½	Maize	4	1
Distillery mixed grains (dried)	3	4	Linseed (crushed) ..	4	3
Wheat middlings ..	3	4¼	Malt culms	4	3½
Indian linseed cake ..	3	6	Egyptian cotton cake ..	4	6¼
Wheat bran	3	7	Maize meal	4	7½
Wheat bran (broad) ..	3	7½	Bombay cotton cake ..	4	11¾
English linseed cake ..	3	7½	Bean meal	5	0¼

TABLE X.

(1) Name of Feeding Stuff.	(2) Nutritive Ratio.	(3) Per cent. digestible. Protein.	(4) Per cent. digestible. Fat.	(5) Per cent. digestible. Carbo-hydrates and Fibre.	(6) Starch equiv. per 100 lb.	(7) Linseed Cake equiv. per 100 lb.
Foods Rich in both Protein and Oil or Fat.						
Ground nut cake	1 : 0·8	45·2	6·3	21·1	77·5	102
Soya bean cake	1 : 1·1	34·0	6·5	21·0	66·7	88
Decort. cotton cake ..	1 : 1·2	34·0	8·5	20·0	71·0	93
Linseed cake, Indian ..	1 : 1·9	27·8	9·3	30·1	77·1	101
Linseed cake, English ..	1 : 2·0	26·7	9·3	30·1	76·0	100
Cotton cake, Egyptian ..	1 : 2·1	15·5	5·3	20·0	40·0	53
Cotton cake, Bombay ..	1 : 2·5	13·1	4·4	21·5	37·6	49
Distillers' grains (English) / Distillers' grains (French)	1 : 2·9	18·7	10·2	29·0	57·3	75
Maize gluten feed	1 : 3·0	20·4	8·8	48·4	87·4	115
Brewers' grains, dried ..	1 : 3·5	14·1	6·6	32·7	50·3	66
Coconut cake	1 : 3·8	16·3	8·2	41·4	76·5	101
Palm kernel cake	1 : 4·5	14·1	6·1	48·9	76·7	101
Linseed	1 : 5·9	18·1	34·7	20·1	119·2	157
Bombay cotton seed ..	1 : 6·0	11·0	16·8	30·1	77·5	102
Fairly Rich in Protein, Rich in Oil.						
Maize germ meal	1 : 8·5	9·0	6·2	61·2	81·0	107
Rice meal	1 : 9·4	6·8	10·2	38·2	68·4	90
Rich in Protein, Poor in Oil.						
Fish meal	1 : 0·1	54·0	4·0	—	60·0	78
Peas, Calcutta white ..	1 : 2·1	23·3	1·1	45·9	66·9	88
Beans, English	1 : 2·6	19·3	1·2	48·2	67·0	88
Beans, Chinese	1 : 2·6	19·6	1·7	47·9	67·0	88
Peas, English maple ..	1 : 3·1	17·0	1·0	50·0	70·0	92
Palm-nut meal (extracted)	1 : 3·4	15·6	1·9	48·7	66·1	87
Brewers' grains, wet ..	1 : 3·5	3·5	1·5	8·6	12·7	17
Malt culms	1 : 3·6	11·4	1·1	38·6	38·7	51
Cereals, Rich in Starch, not Rich in Protein or Oil.						
Barley, feeding	1 : 8·0	8·0	2·1	57·8	67·9	89
Oats, English	1 : 8·0	7·2	4·0	47·4	59·7	79
Oats, Argentine	1 : 8·0	7·2	4·0	47·4	59·7	79
Maize, American	1 : 11·5	6·7	4·5	65·8	81·0	107
Maize, Argentine	1 : 11·3	6·8	4·5	65·8	83·5	110
Maize meal	1 : 13·0	5·5	3·5	63·9	77·8	102
Wheat middlings, fine ..	1 : 4·8	13·2	3·0	53·8	72·0	95
Wheat middlings, coarse or sharps	1 : 5·1	13·8	4·3	50·5	64·0	84
Wheat pollards	1 : 4·5	11·6	4·0	51·6	60·0	79
Wheat bran	1 : 4·7	11·3	3·0	45·0	49·7	65
Wheat bran, broad ..	1 : 4·7	11·3	3·0	45·4	48·1	63
Locust bean meal	1 : 22·1	4·0	0·7	69·2	71·4	94

For this purpose, the best and cheapest cake to buy is ground nut cake, because it contains more protein, in which roots and straw are deficient, than any other feeding stuff. Unfortunately, the supply is at present deficient. Decorticated cotton cake should be a good second, but that, too, is difficult to obtain. Coconut and palm kernel cakes, which are at present fairly plentiful, are, on the whole, not quite so suitable.

Sheep.—The same general principles apply as in the case of bullocks. Older sheep are much more likely to produce eatable mutton on roots and hay in the winter than are lambs. There are many cases recorded in the *Journal of the Royal Agricultural Society* between 1845 and 1850 in which sheep made increases of 1¼ to 1½ lb. per head per week on hay and roots only, but it is no doubt advisable where it can be done to supplement these foods with a small allowance of cake or home-grown oats.

It must not be imagined that the above rations will produce either beef or mutton of the quality that farmers have been accustomed to produce in former years. With the present scarcity of feeding stuffs that is impossible. It is contended, however, that hay, straw and roots, fed to older animals, with a minimum ration of cake or oats, will produce beef or mutton which is eatable, and that is all that can be expected at the present time.

It must also be recognised that the manure produced by such restricted feeding will not contain as much nitrogen as that produced when a full cake ration is used, but this deficiency can be largely remedied by a top dressing of sulphate of ammonia.

Pigs.—The recent wet weather is likely to have the result of producing considerable quantities of diseased potatoes and damaged corn. These articles may, therefore, be added to the millers' offals and palm kernel cake, mentioned last month as the cheapest and most abundant foods suitable for pigs.

Notes on Poultry Feeding.*

APART from the high price of all foodstuffs, the principal difficulty in feeding poultry at present lies in providing them with a suitable and sufficient hard corn ration, as the staple grains of the industry are now largely required for human food.

The Use of Available Hard Corn.—By an Order dated 20th April, 1917, the Food Controller prohibited the use of sound wheat, rice, and rye in any form for feeding poultry. Barley has been requisitioned for human consumption. As the

* Food Production Leaflet No. 2

Government import practically all maize and reserve it for human consumption, very little is available for feeding poultry. The use of oats is not prohibited. As the quantity of oats not required for human consumption is limited, as sparing a use as possible should be made of this cereal in connection with poultry.

The grains available which may be used for feeding poultry are :—

(*a*) Tail corn of all descriptions.
(*b*) Damaged corn of all descriptions.
(*c*) Screenings extracted in the milling of wheat and other cereals.

The prices of damaged grain, tailings, and dressings, harvested in the United Kingdom in 1917, have been fixed by the Grain (Prices) Order, 1917,* made by the Food Controller. There is at present no restriction on the price of tail or damaged corn of foreign origin.

Among the damaged grains of foreign origin may be mentioned " frozen " wheat, a little of which is still available, and also what is known as " torpedoed " wheat (wheat which has been salved from ships damaged by mine or torpedo and subsequently washed and kiln-dried). This wheat has usually a salt taste and musty smell, and is therefore unfit for milling, but when mixed with other grain is a suitable and a valuable food for poultry. The amount available is variable.

Large purchasers can obtain tail corn, damaged corn, and screenings at the various corn markets, but small purchasers will find it more convenient to obtain them in the form of poultry mixtures.

Every effort should be made to economise grain by using increased amounts of meals and vegetables, but it should be remembered that it is difficult to maintain poultry in health and profit on an insufficient ration of hard corn.

Quantity of Hard Corn per Head.—Before the War 2 oz. of hard corn per head per day was the generally accepted allowance for adult poultry. During the War this allowance has been successfully reduced for layers by many skilled poultry keepers, at a time, however, when sound grain was obtainable.

Having regard to the quality of the grain now available it is probable that 1½ oz. per head per day is the minimum amount of hard corn on which adult fowls can be kept successfully.

Food Stuffs for Mashes.—In the absence of sound grain it is fortunate that food stuffs suitable for use in mashes are more plentiful, more varied and of good quality. As most of these

* See p. 673.

produce more human food when fed to animals than when fed to birds, their use must be limited as far as is practicable by using them in mashes with household scraps, boiled cabbage, potatoes (chats), turnip tops, kale, and roots of all kinds. If the supply of garden produce is limited, nettles and grass may be substituted, and mowings from lawns, especially if they contain clover, are very useful.

Silage is not often used for feeding poultry, but it has been employed with excellent results, and it is worthy of the attention of large poultry keepers. Silage can be fed in place of the ordinary soft mash with some middlings added to make it crumbly.

Meals can still further be economised by feeding a plentiful supply of any kind of uncooked green food that is available.

The principal food stuffs at present obtainable for feeding in mashes are the milling offals—bran, middlings, sharps and pollards.

Oatmeal, barleymeal, pea, bean and maize meal are difficult to obtain and prohibitive in price, but fortunately *palm kernel meal* is an efficient substitute for them.

The output of palm kernel meal has increased largely as the result of the expansion of the margarine industry in this country; it is moderate in price, keeps well and has given good results as a poultry food.

Coconut cake has also been used with success.

Meat and blood meals, like all animal products, are scarce and dear, but *fish meal* is still plentiful and, all things considered, moderate in price.

Clover meal is also obtainable in fair quantities, but care should be taken to use only good samples, as it is often adulterated.

Points to be Noted.—(1) At a time like the present great care should be taken to ensure that nothing is wasted.

(2) Food given should be supplemental to that which fowls can obtain by foraging.

(3) After harvest, poultry should be given the run of the stubbles to enable them to utilise waste grain.

(4) All mashes should be fed in troughs.

(5) Grain, except where buried in the litter, should be fed in the same way.

(6) All foods should be stored in rat-and-mouse-proof bins or boxes, since these vermin cause great loss, not only consuming large quantities, but spoiling a great deal more than they eat.

(7) Sparrows, which are probably the biggest robbers of poultry food, should be kept down in numbers.

The following wet and dry mash recipes contain food stuffs which are at present available and are suitable for laying birds. Percentages of the different ingredients are by weight.

Wet Mashes.—As much wet mash should be fed as the birds will eat in 30 minutes after it is placed before them; any then left should be taken away.

(1)	Bran	25 per cent.
	Middlings	30 ,,
	Palm kernel meal, or barley meal, or oatmeal, or maize meal	25 ,,
	Fish or meat meal	20 ,,

The meals should be mixed with an equal quantity of boiled vegetables or household scraps until a crumbly mash is produced. Clover meal may be substituted for the vegetables or household scraps. The clover meal should be scalded with boiling water, covered with a sack and allowed to stand some hours before it is mixed with the meals.

(2)	Cabbage (boiled)	25 per cent.
	Middlings	40 ,,
	Bran	25 ,,
	Fish or meat meal	10 ,,

Mix the meals with the water in which the cabbage has been cooked.

(3)	Bran	26 per cent.
	Middlings	22 ,,
	Clover meal	10 ,,
	Palm kernel meal	18 ,,
	Maize meal	10 ,,
	Fish or meat meal	14 ,,
(4)	Coconut cake	20 ,,
	Middlings	80 ,,

Scald the coconut cake with boiling water and allow it to stand some time before adding the middlings.

Dry Mashes.—Dry mashes should be fed from hoppers or special troughs. It is immaterial whether the birds have access to the dry mash all day, or only part of the day, so long as they eat about 2 oz. each per day in addition to the hard corn ration and green food.

(5)	Bran	25 per cent.
	Middlings	30 ,,
	Palm kernel meal, or maize meal, or oatmeal	25 ,,
	Fish or meat meal	20 ,,
(6)	Bran	40 ,,
	Middlings	20 ,,
	Clover meal	20 ,,
	Palm kernel meal	10 ,,
	Fish or meat meal	10 ,,

The National Egg Laying Test, 1917-18.

A TWELVE months' egg-laying test, commencing in October next, will be undertaken by the National Utility Poultry Society (formerly the Utility Poultry Club) in conjunction with the Great Eastern Railway Company, upon a farm recently acquired by the latter near Ipswich. About 800 pullets of various breeds of fowls will compete, each breed competing in separate sections of the test. Gold, silver, and bronze medals will be awarded, in each section, to the pen of five pullets producing the highest score of eggs laid throughout the twelve months. Special prizes are also offered. Two silver cups will be offered by the Great Eastern Railway Company, one for the highest scoring pen in all sections in the test, and one for the highest scoring pen from East Anglia. The National Society also award the Lamaison Challenge Trophy to the highest scoring pen in the test, and silver cups to the highest scoring pen of those entered by breeders in Scotland, Ireland and Wales respectively.

The test will be under the direction of Mr. J. N. Leigh, the feeding of the birds being conducted strictly under war conditions and in accordance with the orders and recommendations of the Board of Agriculture and Fisheries and the Food Controller.

Entries for the test close on 20th September. Full particulars may be obtained from the Secretary, National Utility Poultry Society, 3, Vincent Square, Westminster, S.W. 1.

Credit for Farmers.*

ARRANGEMENTS have now been concluded with the banks, under which credit will be given, on the recommendation of County Agricultural Executive Committees, for the purchase of any requirements necessary for the increase of food production, including seeds, artificial manures, working horses, machinery and implements, but not for the payment of wages.

Application should be made to the Secretary of the Agricultural Executive Committee for the Administrative County within which the applicant's land is situated, on a form to be obtained from the Committee.

On the approval of an application by the Committee, the applicant will be authorised to order what he requires, and to send the bill to the bank nominated to make the advance. The bank will settle the account, and treat the amount as a special overdraft, repayable under Government guarantee, taking from the applicant a promissory note in the usual form.

* Food Production Leaflet No. 2. See also *Journal*, April, 1917, pp. 91 and 114.

Overdrafts will be charged with interest at the rate of 5 per cent. per annum, and will as a rule be granted for a period of nine months, but at the expiration of that period may be renewed for a further period.

Co-operative societies equally with individual applicants are eligible for the grant of credit under this scheme.

The addresses of the Agricultural Executive Committees for the various Counties of England and Wales, and the names of the Banks participating in the arrangements, are shown in the annexed lists.

I.—ADDRESSES OF AGRICULTURAL EXECUTIVE COMMITTEES.

County.	Address of Secretary.
Anglesey	Shire Hall, Llangefni.
Bedfordshire ..	3, Harpur Street, Bedford.
Berkshire	Shire Hall, Reading.
Birmingham, City of	3, New Street, Birmingham.
Breconshire ..	The Elms, Struet, Brecon.
Bucks	45, High Street, Aylesbury.
Cambridgeshire ..	School of Agriculture, Cambridge.
Cardiganshire ..	College Street, Lampeter.
Carmarthenshire ..	Shire Hall, Carmarthen.
Carnarvonshire ..	County Offices, Carnarvon.
Cheshire	County Offices, Chester.
Cornwall	County Hall, Truro.
Cumberland ..	14, Main Street, Cockermouth.
Denbigh	2, King Street, Wrexham.
Derbyshire ..	County Education Office, St. Mary's Gate, Derby.
Devon	50, Queen Street, Exeter.
Dorset	County Offices, Dorchester.
Durham	48, Old Elvet, Durham.
Essex	East Anglian Institute of Agriculture, Chelmsford.
Flint	40, High Street, Mold.
Glamorgan ..	13, St. Andrew's Crescent, Cardiff.
Gloucestershire ..	Shire Hall, Gloucester.
Hampshire ..	The Castle, Winchester.
Herefordshire ..	21, East Street, Hereford.
Hertfordshire ..	28, Castle Street, Hertford.
Hunts	County Council Office, Huntingdon.
Isle of Ely ..	County Hall, March.
Isle of Wight ..	8, Southsea Terrace, Portsmouth.
Kent	Sessions House, Maidstone.
Lancashire ..	County Offices, Preston.
Leicestershire ..	33, Bowling Green Street, Leicester.
Lincoln (Holland)	Osborne House, Spalding.
Lincoln (Kesteven)	18, St. Peter's Hill, Grantham.
Lincoln (Lindsey)	Corporation Street, Lincoln.
Merioneth ..	Cefntrefor Fawr, Talsarnau, Merioneth.
Middlesex ..	Guildhall, Westminster, S.W. 1.
Monmouthshire ..	24, Bridge Street, Newport, Mon.
Montgomery ..	Agricultural Offices, Welshpool.
Norfolk	11, Prince of Wales Road, Norwich.

County.	Address of Secretary.
Northants ..	County Chambers, Northampton.
Northumberland ..	The Moothall, Newcastle-on-Tyne.
Notts	Shire Hall, Nottingham.
Oxfordshire ..	County Hall, Oxford.
Pembrokeshire ..	8, Victoria Place, Haverfordwest.
Radnor	Agricultural Office, Builth Wells, and County Buildings, Llandrindod Wells.
Rutland	18, Catmose Street, Oakham.
Salop	Shire Hall, Shrewsbury.
Soke of Peterborough	County Council Office, Peterborough.
Somerset	68, Boulevard, Weston-super-Mare.
Staffordshire ..	County Buildings, Stafford.
Suffolk (*East*) ..	County Hall, Ipswich.
Suffolk (*West*) ..	Crescent House, Angel Hill, Bury St. Edmunds.
Surrey	82, Victoria Street, S.W. 1.
Sussex (*East*) ..	Mountfield House, Lewes.
Sussex (*West*) ..	County Hall, West Street, Chichester.
Warwickshire ..	12, Northgate Street, Warwick.
Westmorland ..	15, Lowther Street, Kendal.
Wiltshire	County Offices, Trowbridge.
Worcestershire ..	3, Sansome Place, Worcester.
York (*East Riding*)	County Hall, Beverley.
York (*North Riding*)	County Hall, Northallerton.
York (*West Riding*)	County Hall, Wakefield.

II.—LIST OF BANKS.

Barclays Bank, Limited.
Beckett's Bank, Leeds.
Capital and Counties Bank, Limited.
Co-operative Wholesale Society, Limited (see Note).
County and Westminster Bank, Limited.
Equitable Bank, Limited, Halifax.
Fox, Fowler and Company's Bank, Wellington, Somerset.
Bank of Liverpool, Limited.
Lloyds Bank, Limited.
London City and Midland Bank, Limited.
London Joint Stock Bank, Limited.
London and Provincial Bank, Limited.
London and South Western Bank, Limited.
Manchester and County Bank, Limited.
Manchester and Liverpool District Banking Company, Limited.
Martin's Bank, Limited.
National Provincial Bank of England, Limited.
Northamptonshire Union Bank, Limited.
Nottingham and Nottinghamshire Banking Company, Limited.
Parr's Bank, Limited.
Sheffield Banking Company, Limited.
Union of London and Smiths Bank, Limited.
Union Bank of Manchester, Limited.
Williams Deacon's Bank, Limited.

NOTE.—Advances by the Co-operative Wholesale Society's Bank will be limited to shareholding or purchasing members of Industrial and Agricultural Co-operative Societies, and will be debited to them through the Society of which they are members.

OFFICIAL NOTICES AND CIRCULARS.

Agricultural Returns for England and Wales, 1916.

THE Preliminary Statement of the Agricultural Returns for England and Wales, collected in June last, shows that above 190,000 acres of permanent grass have been brought under the plough since June, 1916, the arable area being 195,000 acres more than a year ago.

The acreage under wheat is slightly greater than a year ago, a decrease of 63,000 acres in that sown

Agricultural Returns of England and Wales, 1916; Preliminary Statement for 1916, compiled from the Returns collected on the 5th June; and comparison with 1915.

CROPS.

DISTRIBUTION.	1917.	1916.	INCREASE.		DECREASE.	
	Acres.	*Acres.*	*Acres.*	*Per Cent.*	*Acres.*	*Per Cent.*
TOTAL AREA (excluding WATER)	**37,137,600**	37,137,600	—	—	—	—
TOTAL ACREAGE under all CROPS and GRASS (*a*)	**27,081,600**	27,074,080	7,520	0·0	—	—
ARABLE LAND	**11,246,040**	11,051,100	194,940	1·8	—	—
PERMANENT GRASS (*a*) — For Hay ...	**4,798,960**	4,825,990	—	—	27,030	0·6
PERMANENT GRASS (*a*) — Not for Hay	**11,036,600**	11,196,990	—	—	160,390	1·4
PERMANENT GRASS (*a*) — TOTAL ...	**15,835,560**	16,022,980	—	—	187,420	1·2
WHEAT — Autumn Sown	**1,724,600**	1,787,320	—	—	62,720	3·5
WHEAT — Spring Sown	**193,950**	124,890	69,060	55·3	—	—
WHEAT — TOTAL	**1,918,550**	1,912,210	6,340	0·3	—	—
Barley	**1,460,600**	1,332,080	128,520	9·6	—	—
Oats	**2,257,480**	2,084,670	172,810	8·3	—	—
Rye	**56,020**	53,480	2,540	4·7	—	—
Beans	**210,860**	236,260	—	—	25,400	10·8
Peas	**131,000**	112,680	18,320	16·3	—	—
Buckwheat	**4,700**	3,300	1,400	42·4	—	—
Potatoes	**508,190**	427,950	80,240	18·8	—	—
Turnips and Swedes	**972,370**	938,160	34,210	3·6	—	—
Mangold	**388,740**	378,140	10,600	2·8	—	—
Cabbage	**39,070**	47,210	—	—	8,140	17·2
Kohl-Rabi	**14,560**	14,600	—	—	40	0·3
Rape	**64,170**	70,820	—	—	6,650	9·4
Vetches or Tares	**78,760**	89,110	—	—	10,350	11·6
Lucerne	**50,210**	54,170	—	—	3,960	7·3
Mustard	**24,790**	65,720	—	—	40,930	62·3
Brussels Sprouts	**11,630**	10,830	800	7·4	—	—
Cauliflower or Broccoli	**9,170**	8,600	570	6·6	—	—
Carrots	**15,520**	10,220	5,300	51·9	—	—
Onions	**6,470**	4,730	1,740	36·8	—	—
Celery	**3,150**	3,510	—	—	360	10·3
Rhubarb	**6,460**	6,850	—	—	390	5·7
Chicory	**550**	460	90	19·6	—	—
Flax	**2,510**	910	1,600	175·8	—	—
Hops	**16,950**	31,350	—	—	14,400	45·9
Small Fruit	**71,940**	73,230	—	—	1,290	1·8
CLOVER and ROTATION GRASSES. — For Hay ...	**1,682,100**	1,762,700	—	—	80,600	4·6
CLOVER and ROTATION GRASSES. — Not for Hay	**817,560**	827,610	—	—	10,050	1·2
CLOVER and ROTATION GRASSES. — TOTAL ...	**2,499,660**	2,590,310	—	—	90,650	3·5
OTHER CROPS	**66,660**	67,650	—	—	990	1·5
BARE FALLOW	**355,300**	421,890	—	—	66,590	15·8
ORCHARDS (*b*)	**259,450**	251,300	8,150	3·2	—	—

(*a*) Excluding Mountain and Heath Land used for grazing (3,901,710 acres in 1917, as compared with 3,816,080 acres in 1916).

(*b*) Any Crop or Grass grown in Orchards is also returned under its proper heading.

LIVE STOCK.

KIND.	1917.	1916.	INCREASE.		DECREASE.	
	No.	*No.*	*No.*	*Per Cent.*	*No.*	*Per Cent.*
Horses used for Agricultural purposes (including Mares for Breeding)	**796,040**	772,770	23,270	3·0	—	—
Unbroken Horses (including Stallions). One year and above ...	**237,400**	227,170	10,230	4·5	—	—
Unbroken Horses (including Stallions). Under one year ..	**104,360**	109,810	—	—	5,450	5·0
Other Horses	**235,020**	249,820	—	—	14,800	5·9
TOTAL OF HORSES	**1,372,820**	1,359,570	13,250	1·0	—	—
Cows and Heifers in Milk ...	**1,831,440**	1,855,450	—	—	24,010	1·3
Cows in Calf but not in Milk ...	**271,540**	252,050	19,490	7·7	—	—
Heifers in Calf	**361,820**	322,180	39,640	12·3	—	—
Other Cattle:—Two years and above	**1,093,770**	1,067,770	26,000	2·4	—	—
,, ,, One year & under two	**1,353,320**	1,374,090	—	—	20,770	1·5
,, ,, Under one year ...	**1,315,260**	1,344,240	—	—	28,980	2·2
TOTAL OF CATTLE	**6,227,150**	6,215,780	11,370	0·2	—	—
Ewes kept for Breeding	**6,872,030**	7,047,110	—	—	175,080	2·5
Other Sheep:—One year & above	**3,563,520**	3,596,960	—	—	33,440	0·9
,, ,, Under one year ...	**6,734,310**	7,307,050	—	—	572,740	7·8
TOTAL OF SHEEP	**17,169,860**	17,951,120	—	—	781,260	4·4
Sows kept for Breeding	**254,290**	283,000	—	—	28,710	10·1
Other Pigs	**1,664,250**	1,884,940	—	—	220,690	11·7
TOTAL OF PIGS	**1,918,540**	2,167,940	—	—	249,400	11·5

in the autumn being rather more than counterbalanced by increased spring sowings. Barley and oats are being grown more extensively than last year, the former showing an increase of 128,500 acres, and the latter one of 173,000 acres; the area under oats is the largest recorded since 1904. Of the pulse crops, beans have been reduced by 25,000 ares, and peas increased by 18,000 acres as compared with last year. The acreage under potatoes has been increased by 80,000 acres, or nearly one-fifth, and is about 10 per cent. greater than the highest previously recorded. The area under roots has also been extended, turnips and swedes by 34,000 acres, and mangolds by nearly 11,000 acres. Green fodder crops have been grown on reduced areas. Mustard has lost the large increase recorded last year, and the area is now below that of 1915. Bare fallow was reduced by 66,500 acres. The area of clover and rotation grasses is 90,000 acres less than last year, nearly all the reduction being in that reserved for hay. The area from which meadow hay was taken also shows a reduction, and altogether the hay area is down by nearly 108,000 acres.

The number of horses on farms increased by 13,000, those used for agricultural purposes showing an increase of 23,000. There are, however, 5,000 less foals than in 1916. The total number of cattle has again been increased, and is the largest ever recorded. The number of cows in milk on the 4th June was 24,000 less than a year ago, but the

total dairy herd is 35,000 larger, the number of heifers carrying their first calves having been increased by nearly 40,000, whilst there were nearly 20,000 more cows in calf but not in milk. Both calves, and cattle from one to two years old, have been reduced in numbers, while those over two years have increased. Sheep show a considerable reduction ; the number of ewes kept for breeding declining by 170,000, and lambs by 570,000. Both sows and other pigs were being kept in smaller numbers, and the total number of pigs was 250,000 less than last year.

The Grain (Prices) Order, 1917.

AN Order (No. 820), dated August 14th, 1917, has been made by the Food Controller to the effect that :—

1. No wheat, rye, oats or barley harvested in the United Kingdom in the year 1917, may be sold at prices exceeding the maximum prices applicable according to the provisions of this Order.

2. (*a*) The maximum price applicable on any transaction shall, subject as hereinafter provided, be a price at the rate specified in the following table :—

Agreed Date of Delivery of Grain Sold.	Wheat and Rye Rate per Quarter of 504 lb.	Oats Rate per Quarter of 336 lb.	Barley Rate per Quarter of 448 lb.
	s. *d.*	*s.* *d.*	*s.* *d.*
Where delivery is to be made before the 1st December, 1917, the price shall not exceed	73 6	44 3	62 9
Where delivery is to be made in the month of December, 1917, or January, 1918, the price shall not exceed	74 6	45 3	62 9
When delivery is to be made in the month of February or March, 1918, the price shall not exceed ..	75 6	46 3	62 9
Where delivery is to be made in the month of April or May, 1918, the price shall not exceed	76 9	47 3	62 9
Where delivery is to be made on or after the 1st June, 1918, the price shall not exceed	77 9	48 6	62 9

(*b*) The rate per quarter applicable for delivery during any period according to the foregoing table is hereinafter called the standard rate.

3. (*a*) Where oats suitable for the manufacture of oatmeal, rolled oats or flaked oats for human consumption are bought by an oatmeal miller specifically for the purpose of such manufacture, or by a recognised dealer specifically buying for resale for such manufacture, the maximum price shall be ascertained by adding 3*s*. per quarter to the standard rate.

(*b*) Where barley is bought by a person requiring and holding a licence from the Food Controller granted for the purpose of entitling him to use barley for a manufacturing business carried on by him,

or by a recognised dealer specifically buying for resale to such a person, the maximum price shall be ascertained by adding 5*s*. 3*d*. per quarter to the standard rate.

4. (*a*) In the case of wheat and rye so damaged as to be unfit for milling, and wheat and rye tailings and dressings, the maximum price shall be ascertained by deducting 7*s*. per quarter from the standard rate.

(*b*) In the case of barley so damaged as to be unfit for milling and barley tailings and dressings, the maximum price shall be ascertained by deducting 7*s*. 9*d*. per quarter from the standard rate.

(*c*) In the case of oats improperly cleaned or containing an undue quantity of soil, and oat tailings and dressings, the maximum price shall be ascertained by deducting 5*s*. per quarter from the standard rate.

5. On the occasion of the purchase of any of the grains mentioned from any person who is a recognised dealer in grain and who is not the producer of the grain sold, the following provisions shall have effect :—

(i.) Where the purchase is made by a flour miller buying for the purpose of his mill, the maximum price shall be ascertained by adding 1*s*. per quarter to the price otherwise applicable according to the foregoing provisions of this Order.

(ii.) Where a purchase is made otherwise than by a flour miller buying for the purpose of his mill, the maximum price shall be ascertained by adding 2*s*. per quarter to the price otherwise applicable according to the foregoing provisions of this Order, provided that where the total quantity of a particular kind of grain purchased by one buyer from one seller does not in any period of seven consecutive days including the day of sale exceed 15 sacks, the maximum price in respect of each quarter so purchased shall be ascertained by adding 4*s*. per quarter to the price otherwise applicable according to the foregoing provision of this Order, and where such total quantity does not in that period amount to one sack the maximum price in respect of each quarter so purchased shall be ascertained by adding 8*s*. per quarter to the price otherwise applicable according to the foregoing provisions of this Order.

6. (*a*) The maximum prices under this Order are fixed on the basis of the following terms and conditions being applicable to the transaction :—

(i.) Payment to be net cash within seven days of completion of delivery and moneys then unpaid thereafter to carry interest not exceeding the rate of 5 per cent. per annum or bank rate, whichever be the higher.

(ii.) Delivery of grain by producer to be free on rail or barge or to mill or store in accordance with the usual custom of the district.

(iii.) Freight, haulage, porterage and cartage from the point where delivery has been or is to be made by the producer to be for the buyer's account.

(iv.) All sack hire up to and including the time of delivery to rail, barge, mill or store by producer to be for the producer's account and all charges for casks subsequent thereto to be for buyer's account.

(*b*) Where the grain is sold on terms or conditions other than the terms and conditions stated in the foregoing part of this clause, a corresponding adjustment shall be made in the maximum price, and for this purpose the cost of delivery for which the producer is liable under the above terms shall be reckoned at the rate of 6*d*. per ton per mile.

7. If the buyer of any home-grown grain sold should require the grain bought to be mechanically treated, the cost of such treatment shall be the subject of a separate agreement and shall not be made a condition of the sale.

8. No person shall sell or buy or offer to sell or buy any of the grain mentioned at a price exceeding the price applicable under this Order, or in connection with a sale or disposition or proposed sale or disposition of any such grain enter or offer to enter into a fictitious or artificial transaction or make any unreasonable charge.

9. None of the foregoing provisions of this Order shall apply to any grain which is suitable for seed and which is also sold specifically for the purpose of seed, and no grain so sold shall be used for any other purpose.

10. No person shall after the 31st August, 1917, sell any wheat, rye, oats or barley whether imported or home-grown otherwise than by weight.*

11. No person shall after 31st August, 1917, torrefy or bleach any wheat, rye, oats or barley whether imported or home-grown.

12. Where any grain is sold to a flour miller such grain shall be deemed to be sold to him for the purpose of his mill until the contrary be proved.

13. For the purpose of this Order :—

"Quarter" shall mean in relation to wheat and rye a weight of 504 lb., and in relation to oats a weight of 336 lb., and in relation to barley a weight of 448 lb.

"Sack" shall mean half a quarter.

"Recognised dealer" shall mean a person who in the ordinary way of his business deals in grain for the purpose of his livelihood.

15. From and after the date of this Order the 1917 Crop (Restriction) Order, 1917†, shall cease to be in force except as regards potatoes but without prejudice to any proceedings in respect of any contravention thereof.

The Meat (Maximum Prices) Order, 1917.

AN Order (No. 903), dated 29th August, 1917, has been made by the Food Controller to the effect that :—

1. No person shall on or after 3rd September, 1917 : (*a*) Sell by way of wholesale sale any carcase of any of the kinds of dead meat specified in the First Schedule, or any hind quarter or fore quarter of imported beef or veal at a price exceeding the maximum price therein mentioned : Provided that—

(i.) In the case of Kosher meat the maximum wholesale price shall in each case be $1\frac{1}{2}d$. per stone in excess of the price otherwise applicable under the Schedule ; and

(ii.) Where the carcase is cut by the seller into smaller portions a further charge not exceeding a charge at the rate of 1*d*. per stone may be made for such cutting ; or

* This Restriction applies to retail as well as wholesale businesses.

† See *Journal*, August, 1917, p. 482, and this *Journal*, p. 684.

(*b*) Sell by way of wholesale sale in any area any side, quarter, joint, or cut of the kinds of dead meat so specified at a price exceeding such maximum price as the Food Controller may from time to time direct for that area.

2. The maximum price applicable under the immediately preceding clause (hereinafter called the Maximum Wholesale Price) shall in each case be the price *ex* market, warehouse, store, or other place of sale.

Nothing contained in this part of this Order shall exempt any person from any of the obligations imposed by Part II. of the Meat (Sales) Order, 1917.

Part II. of the Order, dealing with maximum retail prices, is not here printed.

SCHEDULE OF MAXIMUM WHOLESALE MEAT PRICES.

	Beef and Veal. Price per stone.			Mutton and Lamb. Price per stone.		Pork. Price per stone.	
	Home-killed.	Imported.		Home-killed.	Imported.	Home-killed.	Imported.
	Carcase.	Hind Qtrs.	Fore Qtrs.	Carcase.	Carcase.	Carcase.	Carcase.
1917.							
Sept.	8/8	8/4	7/–	8/8	7/8	9/6	8/6
Oct.	8/4	8/–	6/8	8/8	7/8	9/6	8/6
Nov.	8/–	7/8	6/4	8/8	7/8	9/6	8/6
Dec.	8/–	7/8	6/4	8/8	7/8	9/6	8/6
1918.							
Jan.	7/4	7/–	5/8	8/8	7/8	9/6	8/6

NOTE.—In ascertaining weight, the offals are to be excluded.
" Stone " shall mean stone of 8 lb.

The Bacon, Ham and Lard (Maximum Prices) Order, 1917.

AN Order (No. 910), dated 30th August, 1917, has been made by the Food Controller to the effect that :—

1. No bacon, ham, or lard shall on or after the date of this Order be sold by the importer, manufacturer, or curer thereof at prices exceeding the maximum prices specified for such bacon, ham, or lard in the Schedule hereto.

2. A person shall not sell or offer for sale, or buy or offer to buy any bacon, ham, or lard at prices exceeding the maximum prices provided by clause 1 of this Order, or in connection with any sale or disposition or proposed sale or disposition of bacon, ham, or lard, enter or offer to enter into any artificial or fictitious transaction or make or demand any unreasonable charge.

3. This Order shall not apply to any sale by retail.

4. The expression " Importer " shall include any person sighting the shipper's draft, but this provision shall not be construed so as to limit the general interpretation of that expression.

SCHEDULE.

BACON.

		Per 112 lb.
Irish (Wiltshire Cut)	f.o.b.	162/-
,, Spencers (Green)	,,	162/-
,, Gammons (Green)	,,	168/-
Irish Rolled Bacon (skin on)	*ex* Factory	176/-
Irish Rolled Bacon (skin off)	*ex* Factory	190/-
North of Ireland Dried Rolls	f.o.b.	184/-
English (Wiltshire Cut) (Green)	*ex* Factory	163/-
Wet Shoulder Bellies	*ex* Factory	174/-
Wet Special Sides	,,	174/-
Scotch Ayrshire Rolled Bacon	*ex* Factory	190/-
Danish	*ex* Port	162/-
Canadian—		
Wiltshire Cut ..	*ex* Port	157/-
Canadian Cured American	,,	154/-
Long Rib	,,	153/-
Cumberland	,,	155/-
Long Hams	,,	146/-

(If box-weight terms 1s. per cwt. less.)

		Per 112 lb.
Dutch	*ex* Port	162/-
American—		
Wiltshire Cut ..	,,	152/-
Cumberland Cut ..	,,	152/-
Bellies	,,	160/-
Long Clear	,,	160/-
Short Clear Backs	,,	157/-
Short Rib	,,	157/-
Short Clear	,,	160/-
Rib Backs	,,	159/-
Long Hams	,,	137/-
A/C Hams	,,	137/-
Manchester Cut Hams	,,	137/-
Skinned Hams ..	,,	145/-
Fatless Hams ..	,,	150/-
Stafford Cut Hams	,,	142/-
Square Shoulders ..	,,	128/-
New York Shoulders	,,	122/-
Picnics	,,	110/-
Long Rib	,,	148/-
Dublin Cut	,,	146/-

(If box-weight terms 1s. per cwt, less.)

LARD.

		Per 112 lb.
Scotch Bladders	*ex* Factory	153/-
Irish Bladders (16/30s.)	f.o.b.	148/-
American, Pails	*ex* Port	125/3
American, Boxes ..	*ex* Port	124/-
,, Tierces ..	,,	124/-
,, ,, (Prime Steam)	*ex* Port	122/-

HAMS.

		Per 112 lb.
Irish, Fresh	f.o.b.	144/-
,, *ex* Salt	,,	154/-
,, Smoked or pale dried, short cut ..	f.o.b.	190/-
Irish, Smoked or pale dried, long cut ..	f.o.b.	184/-
,, Boneless Smoked	*ex* Factory	194/-

All these Prices are subject to the following terms :—
Cash in seven days, less 2*d.* in the £ discount ; or cash in one month, less 1*d.* in the £ discount.

The Cheese (Maximum Prices) Order, 1917.

AN Order (No. 911), dated 31st August, 1917, has been made by the Food Controller to the effect that :—

1. (*a*) On and after the 3rd September, 1917, Cheese shall not be sold by or on behalf of the maker thereof at prices exceeding the maximum prices for the time being prescribed by the Food Controller as first hand prices.

(*b*) Until further notice the first hand prices shall, for varieties of cheese mentioned in the Schedule, be prices at the rates set forth in the Schedule.

2. (*a*) On and after the 3rd September, 1917, no person (other than a maker in respect of cheese made by him) shall sell any cheese at a price in excess of whichever shall be the less of the two following prices, namely :—

(i.) A price at the rate of 6*s.* per cwt. above the price paid by him, together with the addition of all monies actually paid for transport.

(ii.) A price at the rate of 10s. per cwt. above the first hand price fixed by this Order, or where further or other first hand prices are fixed under this Order, the first hand price in force at the time of his purchase, with the addition in either case of all moneys actually paid for transport.

(*b*) No addition may be made on account of shrinkage.

(*c*) The amount of the moneys paid for transport shall be shown separately on the invoice.

(*d*) In any proceedings the burden of proving the amount actually paid for transport shall lie upon the person charged.

3. A person shall not sell or offer for sale or buy or offer to buy any cheese at prices exceeding the maximum prices provided by or under this Order, or in connection with any sale or disposition or proposed sale or disposition of cheese enter or offer to enter into any artificial or fictitious transaction or make any unreasonable charge.

4. Every person dealing in cheese shall keep accurate records containing such particulars as are necessary to show whether or not he is complying with the provisions of this Order so far as they relate to him or his trade, and shall make such returns as to his trade in cheese as may from time to time be required by the Food Controller. All such records and relevant documents shall be open to the inspection of any person authorised by the Food Controller.

5. This Order shall not apply to any sale or purchase by retail.

SCHEDULE OF PRICES FOR BRITISH-MADE CHEESE.

	Per cwt.		Per cwt.
Cheddar make	132/-	Partially skimmed	115/-
Cheddar loaf make	132/-	Stilton make ..	1/6 per lb.
Derby and Leicester make ..	132/-	Wensleydale Flat Shape make	129/-
Caerphilly make	119/-	Wensleydale Stilton Shape make	1/6 per lb.
Dunlop make	130/-		
Cheshire, Stafford and Lancashire make	129/-		

In all cases prices are *ex* factory or *ex* farm and include delivery as customary. All these prices are subject to the following terms :—

For cash in 7 days, 2*d*. in the £ discount ; for cash in one month, 1*d*. in the £ discount.

The Butter (Maximum Prices) Order, 1917.

AN Order (No. 913), dated 31st August, 1917, has been made by the Food Controller to the effect that :—

1. (*a*) On and after the 3rd September, 1917, butter shall not be sold by or on behalf of the importer or the maker thereof at a price exceeding the maximum price for the time being prescribed by the Food Controller as the first hand price.

(*b*) Until further notice the first hand price shall, for the several varieties of butter mentioned in the Schedule to this Order, be a price at the rate set forth in the Schedule as applicable thereto.

2. (*a*) On and after 3rd September, 1917, no person (other than an importer in respect of butter imported by him or a maker in respect of butter made by him) shall sell any butter at a price which exceeds by more than the permitted amount whichever shall be the less of the two following prices, namely :—

(i.) The price paid by him for such butter ; or

(ii.) The first hand price fixed by this Order or where further or other first hand prices are fixed under this Order the first hand price in force at the time of his purchase.

(*b*) The permitted amount shall be a sum at the rate of 7*s*. 6*d*. per cwt., with the addition of—

(i.) All moneys, if any, actually paid for transport, after sale by the importer or maker ; and

(ii.) Necessary cold storage charges or expenses (not exceeding the rates current in the district where stored) incurred by the seller before the 3rd September, 1917.

(*c*) The amount of the moneys paid for transport or paid or charged for cold storage shall be shown separately on the invoice.

(*d*) In any proceedings the burden of proving the amount actually paid for transport shall lie upon the person charged.

3. Clauses 1 and 2 of this Order shall not apply to a retail sale.

4. (*a*) On and after 10th September, 1917, no person shall sell butter by retail at a rate per lb. exceeding by more than $2\frac{1}{2}d$. the actual cost to him of the butter sold.

(*b*) An additional sum not exceeding $\frac{1}{2}d$. per lb. may be charged for giving credit and for delivery otherwise than by post or rail. No additional charge may be made for packages.

The actual cost shall in the case of all butter (other than butter imported or made by the person in question) be the net price paid for such butter (not exceeding the maximum price applicable under clause 2 hereof), together with all moneys actually paid for transport not included in such price, and in the case of all butter in respect of which there is for the time being a first hand price shall be the first hand price in force at the time of sale, together with any moneys actually paid for transport in the United Kingdom.

(*d*) In any proceedings the burden of proving the actual cost of the butter sold shall lie on the person charged.

5. (*a*) A Food Control Committee may from time to time prescribe a scale of maximum prices applicable to sales of butter by retail in their area, and may from time to time revoke or vary any scale so prescribed. Any scale prescribed under the powers conferred by this clause shall be in accordance with any general directions which may from time to time be given by the Food Controller.

(*b*) Where any scale has been so prescribed then (subject to any limitations or exceptions prescribed by the Committee) no butter shall be sold by retail within the area of the Committee at prices exceeding the prices provided by the scale.

(*c*) Where the Food Controller so directs a Food Control Committee shall in exercise of the powers and duties conferred by this clause act in combination with any other Food Control Committee or Committees, and in such case the scale or scales prescribed shall apply to the areas of all such Committees.

(*d*) Compliance with the terms of a scale prescribed under the provisions of this clause shall not relieve any person from the necessity of complying with the provisions of clause 4 of this Order.

(*e*) This clause shall not apply to Ireland.

6. A person shall not sell or offer for sale or buy or offer to buy any butter at prices exceeding the maximum prices provided by or under this Order, or in connection with any sale or disposition or proposed sale

or disposition of butter enter or offer to enter into any artificial or fictitious transaction or make any unreasonable charge.

7. Every person dealing in butter shall keep accurate records containing such particulars as are necessary to show whether or not he is complying with the provisions of this Order so far as they relate to him or his trade, and shall make such returns as to his trade in butter as may from time to time be required by the Food Controller or a Food Control Committee. All such records and relevant documents shall be open to the inspection of any person authorised by the Food Controller or the Committee.

8. For the purposes of this Order the expression "importer" shall include the person sighting the shipper's draft; but this provision shall not be construed so as to limit the general interpretation of that expression.

The expression "maker" shall include a blender of butter.

The expression "retail sale" shall include any sale of a quantity not exceeding 4 lb. of butter by the maker of such butter where the total quantity of butter so sold by the maker to the buyer in any one calendar week does not exceed 8 lb.

The expression "Food Control Committee" shall mean a committee appointed in pursuance of the Food Control Committees (Constitution) Order, 1917.

SCHEDULE OF FIRST HAND PRICES.

French Fresh Rolls	*ex* Port	24/- per doz. lb.
.. Paris (unsalted)	,,	220/- per 112 lb.
Australian	,,	206/- ,,
New Zealand	,,	208/- ,,
Argentine	,,	206/- ,,
Canadian	,,	206/- ,,
American	,,	206/- ,,
Irish Creamery or other best		
56 lb. boxes	f.o.r.	206/- net per 112 lb.
28 lb. ,, and casks	,,	207/- ,, ,,
kegs	,,	208/- ,, ,,
Irish Creamery or factory,		
Rolls or bricks (1 or 2 lb.)	,,	25/- net per doz. lb.
,, ,, ($\frac{1}{2}$ lb.)	,,	25/3 net. ,,
Prints ($\frac{1}{2}$ lb.)	,,	25/9 ,, ,,
Blended butter (English Factory) delivered—		
Rolls and bricks (1 lb.)		25/- per doz. lb.
,, ,, ($\frac{1}{2}$ lb.)		25/3 ,,
Prints ($\frac{1}{2}$ lb.)		25/9 ,,

(All unsalted 3*s.* per cwt. extra.)

Except where the price is stated as a net price, discount shall be allowed at 2*d.* in the £ for cash within 7 days, and at 1*d.* in the £ for cash within one calendar month.

The Milk (Prices) Order, 1916.

AN Order (No. 939), dated 7th September, 1917, has been made by the Food Controller to the effect that:—

1. No person shall, directly or indirectly, sell, or offer for sale, or buy or offer to buy, any milk at prices exceeding the maximum prices provided by or in pursuance of this Order.

2. Until otherwise determined, pursuant to this Order, the maximum price applicable on the occasion of a retail sale of milk shall be—

(*a*) For milk delivered within the area of a Rural District Council in England or Wales, or within a district other than a burgh

in Scotland, at the rate of 2*s.* per imperial gallon in the month of October, 1917, and of 2*s.* 4*d.* per imperial gallon thereafter, until the end of March, 1918.

(*b*) For milk delivered elsewhere in England, Scotland or Wales, at the rate of 2*s.* 4*d.* per imperial gallon in the month of October, 1917, and 2*s.* 8*d.* per imperial gallon thereafter, until the end of March, 1918.

(*c*) An addition may be made to the foregoing prices at the rate of 1*d.* per quart for milk delivered in bottles to the consumer's premises if bottled at or before reaching the seller's premises.

(*d*) The foregoing prices shall include all charges for delivery, but it shall be permissible for the Food Control Committee for any area, from time to time, subject to the provisions of this Order, to fix for all or any of the milk sold within their area and not delivered to the purchaser's premises, a rate different from the rate for the time being applicable to milk which is so delivered.

3. Where milk is sold wholesale by or on behalf of the producer, the maximum price chargeable shall be as follows :—

(*a*) For milk delivered during the month of October, 1917, the rate shall be 1*s.* 5*d.* per imperial gallon for milk delivered during the month of November, 1917, the rate shall be 1*s.* 7½*d.* per imperial gallon, and for milk delivered thereafter, until the end of March, 1918, the rate shall be 1*s.* 9*d.* per imperial gallon, together in each case with a sum equal to the net amount of the charges for railway transport actually incurred by the seller.

(*b*) The rates applicable under sub-clause (*a*) of this clause are fixed on the basis that the milk is delivered at the seller's expense to the buyer's premises, or (at the option of the seller) to the buyer's railway station, and that in the latter case all charges for transport beyond the buyer's railway station are borne by the buyer. Where milk is not sold on this basis, a corresponding adjustment shall be made in the rates ; and for this purpose the cost of delivery to the buyer's premises or the seller's railway station shall be reckoned a sum not less than a sum at the rate of ½d. per gallon.

(*c*) No additional charges may be made for the provision of churns or other vessels.

4. (*a*) Where milk is sold wholesale by or on behalf of any person other than the producer, the maximum prices chargeable shall, until otherwise determined pursuant to this Order, be as follows :—

(i.) In the case of milk other than accommodation milk, the rate shall be 1*s.* 8*d.* per imperial gallon for milk delivered during October, 1917, and 2*s.* per imperial gallon for milk delivered thereafter, until the end of March, 1918.

(ii.) In the case of accommodation milk, the rate shall be 1*s.* 10*d.* per imperial gallon for milk delivered during October, 1917, and 2*s.* 2*d.* per imperial gallon for milk delivered thereafter, until the end of March, 1918.

(iii.) The rates mentioned in sub-clauses (i.) and (ii.) of this clause include all charges for delivery to the buyer's railway station if the milk is carried by rail, and for delivery to the buyer's premises if not so carried. If rail-borne milk is

delivered by or at the expense of the seller to the buyer's premises, the rate may be ½*d.* per imperial gallon higher than the rates so mentioned.

(iv.) The rate fixed by the foregoing sub-clauses of this clause are fixed upon the basis that the cost of providing churns or other vessels is borne by the seller; and where milk is not sold on this basis, then the rate shall be ascertained by deducting from the rate applicable under this clause the sum of ¼*d.* per gallon.

(*b*) No milk sold shall be sold wholesale by a person other than the producer of the milk sold, except upon the terms that the milk is to be delivered by or at the expense of the seller to the buyer's premises or the buyer's railway station.

(*c*) For the purpose of this clause accommodation milk shall not include—

(*a*) Milk on the occasion of the sale of any such milk by or on behalf of the person owning the stock from which such milk is produced; or

(*b*) Milk sold under a contract or arrangement for delivery over a continuous period exceeding three days; or

(*c*) Milk sold otherwise than for the purpose of meeting fluctuating demands of the buyer.

5. A Food Control Committee may, except in the case of wholesale sales by or on behalf of producers, from time to time by resolution vary the maximum price for milk delivered within their area, or any part of such area, but:

(*a*) Every such resolution shall be reported to the Food Controller within seven days, and shall not take effect (i.) in the case of a resolution reducing the maximum price until three days after it shall have been so reported or such later time as the Food Controller may direct, and (ii.) in the case of a resolution increasing a maximum price until the same has been sanctioned by the Food Controller; and

(*b*) Every resolution of a Food Control Committee under this clause shall be subject at any time to review by the Food Controller, and shall be withdrawn or varied as he may direct.

6. A person dealing in milk shall not buy, or agree to buy, or deal in any milk of which in the ordinary course of business he does not intend to take actual delivery.

7. No person shall, in connection with the sale or disposition or proposed sale or disposition of any milk, enter or offer to enter into any fictitious or artificial transaction or make or demand any unreasonable charge.

8. A Food Control Committee may, subject to the consent of the Food Controller—

(*a*) Buy milk from any person and sell milk so bought at a price estimated to cover at least the cost of purchasing and distributing such milk; and

(*b*) Make arrangements as to the distribution of milk in their area.

9. (*a*) A Food Control Committee may—

(i.) Direct any wholesale or retail dealer delivering milk in their area to deliver such milk to any consumer or class of consumers in priority to any other person in their area; and

(ii.) Direct any person selling milk by retail within their area to deliver in that area only within such parts thereof as the Committee may prescribe; and

(iii.) With the consent of the Food Controller give directions in their area for securing the purity, cleanliness and wholesomeness of milk, provided that any directions so given shall not relieve Local Authorities of their powers and duties under any existing statutory provisions in regard to milk, or relieve cow-keepers, dairymen, purveyors of milk or occupiers of milk shops from their obligations under any such provisions.

(*b*) Every person to whom any direction is given under the powers conferred by this clause shall comply with such direction.

10. A Food Control Committee shall not, without the consent of the Local Authority or Authorities by whom they were appointed, exercise the powers conferred upon them by the two immediately preceding clauses in such a manner as may involve an expense which is ultimately to be borne by such authority or authorities, provided that the validity of any direction given by a Food Control Committee under any such powers shall not be questionable on the ground that such consent has not been obtained.

11. The provisions of this Order relating to prices shall not apply to—

(*a*) Condensed Milk, Dried Milk or Milk preparations; or

(*b*) Milk sold for consumption on the premises of the seller.

12. For the purposes of this Order—

"Food Control Committee" shall mean a committee appointed in pursuance of the Food Control Committees (Constitution) Order, 1917.

"Buyer's railway station" shall mean the railway station to which in the ordinary course of business the milk would be consigned by the seller to the buyer.

15. The Price of Milk Order, 1917, and the Price of Milk Order, No. 2, 1917, are hereby revoked as on the date when this Order comes into force, but without prejudice to any proceedings in respect of any previous contravention thereof.

16. (*a*) This Order may be cited as the Milk Order, 1917.

(*b*) This Order shall come into force on the 1st day of October, 1917.

(*c*) This Order shall extend only to Great Britain.

The Barley (Restriction) Order, 1917.

AN Order (No. 821), dated 15th August, 1917, has been made by the Food Controller to the effect that:—

1. (*a*) No person shall on or after the 1st September use any barley except for the purpose of seed or except in the process of manufacturing flour.

(*b*) This clause shall not apply to tailings or screenings or barley which has been so damaged as to be unfit for milling.

2. (*a*) No person shall on or after the 1st September use any barley flour, except in the manufacture of articles suitable for human food, or use any article containing barley flour except as human food.

(*b*) This clause shall not apply to barley flour which on the 1st September, 1917, has been so treated as to be unsuitable for the purpose of human food, or to any barley flour or any article containing barley flour which is or may become unfit for such purpose.

3. No person shall damage or permit to be damaged on or after 1st September, 1917, treat or permit to be treated any barley or barley flour or any article containing barley flour so as to render the same less fit for the purpose for which under this Order it is reserved.

4. Any person authorised by the Food Controller and any Local Authority empowered to enforce the provisions of this Order, may take sample of any barley or barley flour, or other article which he has reason to suspect is being used, treated or damaged in contravention of this Order.

5. If any question shall arise whether any barley is so damaged as to be unfit for milling or whether any barley flour or article containing barley flour is unfit for the purpose of human food such question may be referred to and determined by any person authorised in that behalf by the Food Controller or, in England and Wales and Scotland, by a Local Authority empowered to enforce this Order as to barley or barley flour or any such article within the district of such Local Authority.

6. After the 31st August, 1917, the Maize, Barley and Oats (Restriction) Order, 1917,* shall cease to be in force as far as the same relates to barley, but without prejudice to any proceedings in respect of any previous contravention thereof.

THE following Order (No. 896) is dated 28th August, 1917 :—

The 1917 Crop (Restriction) Order, 1917.†

The Food Controller hereby authorises all persons concerned until further notice to buy, sell and deal in potatoes of the 1917 crop grown in the United Kingdom, provided that all potatoes so dealt in shall be bought and sold for delivery before the 15th September, 1917.

AN Order (No. 914), dated 31st August, 1917, has been made by the Food Controller to the effect that :—

The Hops (Restriction) Order, 1917.

No person shall without a permit issued under the authority of the Food Controller, either on his own behalf or on the behalf of any other person, buy or sell or agree or offer to buy or sell any hops whether imported or home-grown. A person shall not without a permit issued under the authority of the Food Controller make delivery of any hops contracted to be sold by him before the 4th September, 1917.

THE following Circular, dated 15th August, 1917, has been addressed by the Board of Education to Local Education Authorities and Secondary Schools, etc. :—

Scheme for Harvesting Horse-chestnuts by School Children.

The Board of Education has been requested by the Minister of Munitions and the Food Controller to bring the following scheme to the notice of School Authorities, Governing Bodies and Teachers, and to request their assistance in giving effect to it.

* See *Journal*, June, 1917, p. 366.

† See also *Journal*, August, 1917, p. 482, and this *Journal*, p. 675.

A considerable quantity of grain is at present being used in certain industrial processes which are essential to the prosecution of the war. In order to set this grain free for human consumption, experiments have been made to discover a substitute which could be utilised for the industrial processes concerned, and a substitute suitable in every respect has been found in the horse-chestnut. The experiments prove that for every ton of horse-chestnuts which are harvested, half a ton of grain can be saved for human consumption. The horse-chestnut, therefore, though itself totally unfit for food, can be utilised indirectly to increase the national food supply.

It is therefore urgently necessary that this year's crop of horse-chestnuts should be harvested. In present circumstances it is felt that school children could give most valuable assistance in collecting the chestnuts, and by so doing make a definite contribution to national efficiency. It is suggested, therefore, that the Governing Bodies, Managers and Teachers of Schools should organise the efforts of the children for the purpose. To effect this a small committee might be formed in connection with each school, or convenient group of schools, to undertake the organising work in connection with the scheme in the district concerned and to answer inquiries.

It is understood that in many districts the scheme has already been taken up by private individuals, and it is obviously desirable that all persons undertaking work in connection with the scheme should co-operate with one another.

One of the duties of such a committee as is suggested above would be to see that the chestnuts gathered in their district are collected in a heap in some convenient place, preferably under cover; exposure to the weather will not, however, damage the nuts, provided that the interior of the heap does not heat.

The nuts suffer no harm from lying on the ground where they fall. They may therefore be collected either from the trees or from the ground after being shed, as may be the more convenient. Before being deposited at the collecting station they should be freed from the outer green husk, the shells of the nuts being left intact. If the husks are not removed, heating of the heaps will certainly take place.

A limited number of sacks and baskets are available for the collection of the nuts, and where there is any difficulty in obtaining bags or baskets locally, application should be made to the Director of Propellant Supplies, Ministry of Munitions, 32, Old Queen Street, London, S.W. 1.

When the collection is complete the committee should inform the Director of Propellant Supplies, as above, stating the estimated quantity of the collection, and the Ministry of Munitions will arrange to remove the nuts and forward them to the factories in the course of the winter.

Further copies of this Circular can be obtained on application to the Secretary, Board of Education, Victoria and Albert Museum, Exhibition Road, South Kensington, London, S.W. 7.

IN a Memorandum, dated 4th September, 1917, and addressed by the Food Production Department of the Board to the Agricultural Executive Committees in England and Wales, the Department appeals to landowners, farmers and others to afford all reasonable facilities for the work of harvesting horse-chestnuts to proceed and not to place any unnecessary difficulties in the way of the children who may seek in this way to contribute to national efficiency.

THE following Circular Letter, dated 15th August, 1917, has been addressed by the Director of Supplies, Food Production Department, to County Agricultural Executive Committees in England and Wales :—

Scheme for the Supply of Seed Wheat of the 1917 Crop.

I am directed to refer to previous correspondence regarding supplies of seed wheat for autumn sowing,* and to inform you that arrangements are now being completed for the distribution of a limited quantity of certain varieties of the 1917 crop to farmers through the Supplies Sub-Committee of the Agricultural Executive Committee.

The varieties of seed wheat which will be available are :—" Wilhelmina," " Victor," " Little Joss," and " Browick " ; and the Department is not prepared to supply seed of any other variety.

It is considered desirable that farmers should be informed that this scheme is not intended to interfere with the ordinary interchange of seed wheat through the regular channels of trade.

The Department has purchased a limited quantity of seed of the varieties named in order to meet the requirements of those who may not be able to obtain these varieties in the ordinary way.

The stocks purchased by the Department have all been inspected in the field by a Committee appointed for the purpose, who have exercised special care in securing wheat with a high percentage of purity.

The order from the farmer should be transmitted to the Department through the Supplies Sub-Committee, and the farmer should be asked to name a second variety which he is willing to take in the event of the supply of any one variety becoming exhausted. The Supplies Sub-Committee should satisfy themselves that the applicant requires the wheat for sowing and that he is willing to pay cash before delivery on receipt of a notification from the Department of the amount due. The price charged to the farmer for the seed wheat will be 15*s*., 20*s*. and 25*s*. per quarter of 480 lb. (according to the standard of purity) above the maximum price fixed for milling wheat, and will include the cost of new non-returnable sacks (valued at 2*s*. each).

Any wheat of the varieties named above which the Agricultural Executive Committee may require for planting land which they are cultivating will be supplied on receipt of a formal application giving particulars of requirements and instructions for dispatch.

All consignments of seed will be sent carriage forward, and the consignee will be advised of the date of dispatch.

Orders for seed should be transmitted on special forms provided for the purpose. A specimen form is enclosed for your guidance,† and supplies of these may be obtained on application to the Department.

I am to request you to be good enough to advise farmers in the county to place orders for seed wheat of the varieties named *as early as possible*, and these orders should be transmitted by your Committee to the Department as they are received, but in no case later than the 15th October, 1917, after which date orders cannot be accepted.

AN Order, dated 20th August, 1917, has been made by the Minister of Munitions to the effect that :—

Superphosphate Order.

1. As on and from the day following the date of this Order the maximum prices for superphosphate shall be as follows :—

(*a*) In the case of sales or purchases for delivery in railway trucks at purchaser's or consumer's siding or nearest railway station,

* See *Journal*, July, 1917, pp. 468, 469. † Not here printed.

or *ex* barge or ship at purchaser's or consumer, wharf, or in the case of sales or purchases for shipment to the Channel Islands, f.o.b. at port of shipment, the prices specified in the schedule hereto, but less a discount or deduction of 2*s*. 6*d*. per ton on sales of 2 tons and upwards by makers or producers to Manure Mixers, Agricultural Merchants and Dealers, and Co-operative Societies registered under the Friendly Societies' Acts.

(*b*) In the case of sales or purchases for delivery at maker's or producer's works free into purchaser's or consumer's carts or wagons for conveyance direct by road to consumer's premises, the prices specified in the schedule hereto less 10*s*. per ton.

(*c*) In the case of sales or purchases for delivery *ex* vendor's store or shop, or *ex* warehouse, railway goods yard or public wharf, the prices specified in the schedule hereto with the addition of the following amounts according to the quantity of Superphosphate included in the sale or purchase, namely :—

Quantity Sold or Purchased.	*Additional Price Authorised.*
4 tons and over	5*s*. per ton.
1 ton and over but less than 4 tons ..	10*s* ,, ,,
2 cwt. and over but less than 1 ton ..	1*s* ,, cwt.
Less than 2 cwt.	2*s*. ,, ,,

Provided that such additional prices shall not be charged or paid in the case of sales or purchases of more than 1 ton for delivery *ex* railway goods yard or public wharf.

(*d*) In the case of sales or purchases for delivery by road at consumer's premises from vendor's store or shop, or from warehouse, railway goods yard, or public wharf, the maximum prices authorised under paragraph (*c*) above, plus cost of or local rates for cartage or haulage.

2. The maximum prices fixed by paragraphs (*a*) and (*b*) of clause 1 of this Order shall not apply to any sale or purchase by or from a maker or producer for delivery as mentioned in those paragraphs where the quantity of Superphosphate included in the sale or purchase is less than 2 tons ; and none of the provisions of clause 1 hereof shall apply to any sale of Superphosphate for export from the United Kingdom. But save as aforesaid no person shall, as on and from the day following the date of this Order until further notice, effect or offer to effect any sale or purchase of Superphosphate except for delivery in accordance with the terms specified in one or other of sub-paragraphs (*a*), (*b*), (*c*) and (*d*) of clause 1 of this Order, and at a price not exceeding that prescribed by the said clause and the schedule hereto as the maximum price (having regard to quantity, quality, and date for and terms of delivery) for such sale or purchase.

3. The maximum prices fixed by clause 1 of this Order are net prompt prices for Superphosphate in maker's or vendor's bags. Where credit is given to the purchaser a reasonable extra charge may be made, provided that a price for net prompt cash is quoted on the invoice and does not exceed the maximum price authorised. If purchaser's bags are used, a reasonable allowance shall be made.

4. All persons engaged in producing, manufacturing, selling, distributing or storing Superphosphate, or in any manufacture in which the same is used, shall make such returns with regard to their businesses as shall from time to time be required by or under the authority of the Minister of Munitions.

5. All the provisions of the Fertilisers and Feeding Stuffs Act, 1906, and the regulations made by the Board of Agriculture and Fisheries in pursuance of the provisions of that Act shall apply *mutatis mutandis* to this Order.

6. For the purposes of this Order Superphosphate shall mean Superphosphate of Lime manufactured from mineral phosphate, but shall not include Basic Superphosphate, Bone Superphosphate, Dissolved Bones, Bone Meal or Bone Compound, Guanos or Compound Manures.

NOTE.—All applications in reference to this Order should be addressed to the Director of Acid Supplies, Ministry of Munitions, Department of Explosives Supply, Storey's Gate, Westminster, S.W. 1, and marked "Fertilisers."

THE SCHEDULE.

Maximum prices for Superphosphate referred to in clause 1 of the above Order :—

Percentage of Tri-Basic Phosphate of Lime rendered soluble in water.	*Price per ton.* £ s. d.
15 per cent. or over but less than 16 per cent.	4 12 6
16 " " " 17 "	4 15 0
17 " " " 18 "	4 17 6
18 " " " 19 "	5 0 0
19 " " " 20 "	5 2 6
20 " " " 21 "	5 5 0
21 " " " 22 "	5 7 6
22 " " " 23 "	5 10 0
23 " " " 24 "	5 12 6
24 " " " 25 "	5 15 0
25 " " " 26 "	5 17 6
26 " " " 27 "	6 0 0
27 " " " 28 "	6 2 6
28 " " " 29 "	6 5 0
29 " " " 30 "	6 7 6
30 " " " 31 "	6 10 0
31 " " " 32 "	6 14 0
32 " " " 33 "	6 18 0
33 " " " 34 "	7 2 0
34 " " " 35 "	7 6 0
35 " " " 36 "	7 10 0
36 " " " 37 "	7 14 0
37 " " " 38 "	7 18 0
38 " " " 39 "	8 2 0
39 " " " 40 "	8 6 0
40 " " " 41 "	8 10 0
41 " " " 42 "	8 14 0
42 " " " 43 "	8 18 0
43 " " " 44 "	9 2 0
44 " " " 45 "	9 6 0

The above prices for all qualities are for orders placed for delivery during December, 1917. In the case of orders placed for delivery during other months, the above prices are in each case to be reduced

or increased 1*s.* per ton per month according as the month for delivery precedes or is subsequent to December, 1917, but with a maximum increase of 5*s.* per ton, (*e.g.* the prices for October, 1917 deliveries will be 2*s.* less per ton, while the prices for May and June, 1918 deliveries will be 5*s.* more per ton than the prices set out above).

Distribution of Superphosphate.

A NOTICE (F.P. 112), dated 27th August, 1917, has been issued by the Food Production Department of the Board, summarising the provisions of the Superphosphate Order (printed above) and giving the following information as to the distribution of the manure :—

It is hoped that the output of superphosphate will be sufficient to meet the demand. It is, however, very desirable that orders should be placed at once. It has been arranged that makers will accept orders for delivery in any specified month up to the limit of their output in that month, in the order in which they are received. Deliveries which cannot be made in the month promised will be made as soon as possible thereafter, but at the price of the month for which they were promised. If an order is accepted for delivery as soon as possible without any month being specified the price will be according to the month in which delivery is made.

Farmers should place their orders with the maker, dealer or agent with whom they are accustomed to deal, and take delivery at the earliest possible date. In the event of any difficulty in obtaining supplies, application should be made to the Secretary, Phosphates and Potash Distribution Committee, 72, Victoria Street, London, S.W. 1.

Merchants of repute are being recognised by the Agricultural Executive Committees in England and Wales, as approved agents for the sale of fertilisers, and the names of these merchants can be obtained on application from the Food Production Department.

The Seed Potatoes (Immune Varieties) Order, 1917.

AN Order (No. 935), dated 5th September, 1917, has been made by the Food Controller to the effect that :—

1. (*a*) No potatoes of the varieties "King George V.," "Great Scot," "Lochar," and "Templar," grown in Scotland or in England or Wales in the year 1917, may be sold or otherwise disposed of or moved from the premises on which they were situate on the 6th September, 1917, except under a licence issued by the Board of Agriculture and Fisheries or by the Board of Agriculture for Scotland.

(*b*) Contracts existing at the date of this Order for the sale of any such potatoes shall stand cancelled except so far as relates to potatoes which are delivered prior to the 6th September, 1917, or which may be delivered on or after that date under and in accordance with the terms of any licence that may be granted under this clause.

(*c*) The foregoing provisions of this Order shall not effect the use of any potatoes by the grower thereof in his own household or as seed for the purpose of his farm or holdings.

2. Clause 1 of this Order shall apply only to potatoes in the hands of a person who has in his hands upwards of 5 tons of potatoes of the description mentioned in clause 1 or who has under cultivation upwards of a half acre of such potatoes.

3. (*a*) Every such person as mentioned in clause 2 shall before the 15th September, 1917, make a return on the form prescribed in the Schedule,* showing the quantity in tons of potatoes of the descriptions mentioned in clause 1, in his possession on that day and the acreage which he has under potatoes of such description, and the situation of such potatoes and acreage.

(*b*) The returns shall be made as to potatoes in England and Wales to the Board of Agriculture and Fisheries, and as to potatoes in Scotland to the Board of Agriculture for Scotland.

4. This Order shall not apply in Scotland to potatoes which will pass through a riddle having a mesh of 1 in., or in England or Wales to potatoes which will pass through a riddle having a mesh of 1¼ in.

Order Taking Possession of Flax Grown in the United Kingdom.

AN Order, dated 25th August, 1917, has been made by the Minister of Munitions to the effect that :—

1. He hereby takes possession as from the date hereof of :—

(*a*) All flax of the 1917 crop grown in the United Kingdom as and when harvested.

(*b*) All flax grown in the United Kingdom at any time and not at the date hereof in the possession of a flax spinner for the purpose of his business.

(*c*) All other flax, except Russian flax, now or hereafter situated in the United Kingdom.

2. The flax, of which possession is hereby taken under paragraph 1 (*a*) and (*b*), will be divided under the directions of the Controller of Aeronautical Supplies into six grades, according to its quality, handling and cleaning, and the Minister will pay the following prices therefor :—

	s.	*d.*				
Special grade	35	0	per stone	delivered	at the	appointed centre.
1st ,,	32	6	,,	,,	,,	,,
2nd ,,	30	0	,,	,,	,,	,,
3rd ,,	27	6	,,	,,	,,	,,
4th ,,	26	3	,,	,,	,,	,,
5th ,,	25	0	,,	,,	,,	,,

Flax which is inferior in quality to that of the 5th grade hereinbefore mentioned will be paid for upon terms which will be subsequently communicated to the various owners.

3. If after this Notice and Order any person having control of any flax of which the Minister has taken possession hereunder sells, removes or secretes such flax without the consent of the Minister, he will be guilty of an offence against the Defence of the Realm Regulations.

4. No person shall, as from the date hereof, until further notice, purchase, sell, offer to purchase or sell, or, except for the purpose of carrying out a contract in writing, existing prior to the date hereof, for the purchase of such flax, enter into any transaction or negotiation in relation to the sale or purchase of any flax situated outside the United Kingdom.

5. Further directions with regard to the delivery of flax, of which possession is taken hereunder, will shortly be issued on behalf of the Minister by the Controller of Aeronautical Supplies.

6. All communications upon the subject of this Notice and Order should be for the present addressed to the Controller of Aeronautical

* Not here printed.

Supplies, and marked Flax Supplies, Department S. (M.A.), 1, Air Board Office, Strand, London, W.C. 2.

THE following Notice, dated 1st September, has been issued by the Ministry of Food :—

Army Cattle Purchase.

The arrangements that have been made for the purchase of cattle in the United Kingdom for the feeding of the Army during the next few months have been revised in the light of a reduction in the demands of the Army, which were originally estimated at 250,000 head. The reduction in the weekly purchases will be spread over the whole area and a smaller number of stock will be taken from England, Scotland and Ireland. The purchases will be carried out in England by traders nominated by the Auctioneers' Institute, and in Scotland by a committee of auctioneers, but in Ireland the Army authorities will buy cattle through their own agents, as the Army has for some time been possessed of an organisation for the direct purchase of agricultural produce in Ireland. The buyers have been instructed to purchase cattle in a condition to yield good lean meat, beyond that of "stores" three-quarters fat, but not "prime." The purchases will be effected at market rates, which are expected to rule below the maxima fixed by the Food Controller.

THE following Notice, dated 6th September, 1917, was issued by the Board of Agriculture and Fisheries :—

Reduction of Acreage under Hops.*

Under the Defence of the Realm Act, Regulation 2 N, N, every hop-grower is required to reduce the acreage on his holding cultivated with hops to one-half of the acreage cultivated with hops on his holding in June, 1914, but he is permitted to retain hop plants on an acreage in excess of the half of his 1914 acreage if the excess acreage is properly interplanted with other crops, and the hops thereon are not picked. The picking of any hops that may be produced on this excess acreage is therefore an offence under the Regulation. The operation of the Regulation is not limited to 1917, and while the War continues hop-growers must be prepared to maintain this reduction of the acreage cultivated with hops, and possibly to reduce the acreage in 1918 to a greater extent.

An acre of hops must be taken as an imperial acre of land, and must not be calculated by the number of plants or the number of strings and poles.

AT farms near Castle Bromwich and Saltley, in Warwickshire, on 5th October, a test meeting for women farm workers in the Midland counties is to be held. This gathering is the first of its kind ever arranged in this country, and it may very well prove historic. Its promoters are the Women's Branch of the Food Production Department of the Board of Agriculture, and the details are being worked out by the travelling inspectors of that body. The fixture is a definite part of the scheme recently elaborated by the Department for the training and placing of women on the land. The trial farms are within easy reach of Birmingham; and Birmingham itself, of course, is one of the most convenient of the great Midland

Testing the Farm Women.

* See also *Journal*, April, 1917, p. 113; June, 1917, p. 371; and August, 1917, p. 591.

centres. It should be clearly understood by intending visitors that this meeting is not simply one for the purpose of demonstrating what a few picked women can do. It is, in fact, a gathering for the examination in farm practice of a large number of women who have worked on farms for periods varying from three months to a year or more.

Only those competitors who are nominated by the Agricultural Executive Committee or the Women's War Agricultural Committee of their county and can bring a farmer's certificate of efficiency will be allowed to compete. The competitors will represent the counties of Worcester, Warwick, Stafford, Shropshire, Gloucester, Derby, Leicester, Northampton, Oxford and Nottingham, and the administrative area of Birmingham. The tests will cover milking, hand and mechanical; care of stock; harnessing; driving; ploughing with horses and motor tractors; machinery repairing; thatching; threshing; hoeing and singling, pulling, cleaning and piling roots; trussing; mowing by hand; ridging and drilling, etc. The Lord Mayor of Birmingham is taking a keen interest in the scheme, and a representative committee of management has been appointed in consultation with the Agricultural Societies, Farmers' Unions and the Women's Organisation. The judges will be experienced working farmers, and in every possible way the tests will be made the means of ascertaining real proficiency in the competitor as distinct from the special preparation occasionally indulged in for so-called examinations.

It is hoped that the meeting will tend markedly to raise the esteem of women agricultural labour in the eyes of the farming class generally, as well as to raise the standard of excellence to which earnest women workers on the land would naturally aspire. As a result of the meeting, certificates will be given to those women who obtain a certain percentage of marks. Thus farmers will know that in employing the women who hold the certificates they have workers of proved efficiency. If, as seems certain, the meeting should be a great success, similar meetings will be held in other parts of the country. Full particulars can be obtained on application to the Food Production Department, 72, Victoria Street, S.W. 1, or to Miss Day, Food Production Department travelling inspector, 85, Malden Road, Worcester.

The "National Food Journal."

THE first number of the *National Food Journal*, issued by the Ministry of Food, and to appear on the second and fourth Wednesdays in each month, was published on 12th September. The new periodical can be purchased through any bookseller, or directly from H.M. Stationery Office, at *2d.* net per copy. In a prefatory article Lord Rhondda states very clearly his views on the position of food control, the aims of the Ministry, and the absolute need for economy in the use of all foodstuffs. Other articles deal fully with the constitution and duties of the Local Food Control Committees, the Sugar Distribution Scheme, Milk Prices, the Ninepenny Loaf, the Controller's Problem, etc. There is a very useful time table showing the dates between 15th September and the end of the year on which the various Food Orders become operative, a list of official maximum wholesale and retail prices, and a number of public announcements on such subjects as supplies and rations. Several attractive recipes for preparing dishes of potatoes are also included.

The Statutory Rules and Regulations published by the Ministry of Food since 22nd August are issued in an 8-page supplement to the first number.

MISCELLANEOUS NOTES.

Notes on Crop Prospects Abroad.

The *International Crop Report and Agricultural Statistics* for August, 1917, published by the International Institute of Agriculture, gives the following particulars concerning the estimated production of cereal crops: *Wheat.*—The total production this year in Spain, France, Ireland, United States, British India, and Japan is placed at 170,686,000 qr., or an increase of 0·7 per cent. as compared with 1916. *Barley.*—The estimated yield in 1917 in Spain, Ireland, and the United States is placed at 34,529,000 qr., an increase of 4·9 per cent. as compared with last year. *Oats.*—The production in Spain, Ireland, and the United States is estimated to amount to 161,337,000 qr. this year, or 16·9 per cent. above last year.

France.—According to the official report the condition of the crops on 1st August was as follows: (80 = good, 60 = fairly good, 50 = passable)—Winter wheat, 56; spring wheat, 64; rye, 62; maize, 69; winter barley, 61; spring barley, 69; winter oats, 57; and spring oats, 69. (*The London Grain, Seed, and Oil Reporter*, 28th August.)

Spain.—A revised official estimate gives the yield of wheat this year as being 17,630,000 qr., as compared with 18,950,000 qr. in 1916. (*The London Grain, Seed, and Oil Reporter*, 7th September.)

Canada.—The Census and Statistics Office at Ottawa reported, on the 17th August, that the preliminary estimate of the average yield per acre of autumn-sown wheat was 22 bush., as compared with 21½ bush. in 1916; the total production of winter wheat this year is thus estimated at 17,816,000 bush. Throughout eastern Canada the condition of the crops on 31st July was reported as excellent; in Saskatchewan wheat was filling well; and in Manitoba wheat and other corn crops were improving.

In later reports of the High Commissioner, dated the 23rd and 30th August, it is stated that good weather in western Canada has had a favourable effect in filling the grain, and has set at rest the anxiety felt owing to the lateness of the season. Threshing operations have been started in Alberta. There will be a considerable increase in the new land broken up this year, and the acreage under crop next season is expected to be much in excess of the area this year.

Harvesting throughout Canada was in full swing by 6th September in Manitoba threshing results indicated good samples, and in Alberta the crop is grading well.

United States.—The Crop Reporting Board of the Department of Agriculture, in a report issued on the 7th September, estimates that the average condition of spring wheat at the time of harvest was 71·2, as compared with 74·0, the average of the previous ten years; oats, 90·4, against 75·8; and barley, 76·3, against 78·9; whilst the condition of maize on the 1st September was 76·7, as compared with 73·2; and linseed 50·2, against 78·0, the decimal average.

The total production of the corn crops in the United States this year is given as follows (figures for 1916 in brackets): Wheat, 668,000,000 bush. (639,886,000); maize, 3,248,000,000 bush. (2,583,241,000); oats, 1,533,000,000 bush. (1,251,992,000); barley, 204,000,000 bush.

(180,927,000); rye, 56,000,000 bush. (47,383,000); linseed, 11,000,000 bush. (15,459,000). (*London Grain, Seed, and Oil Reporter*, 8th September).

New Zealand.—This season's crop of wheat in North Island is estimated at only 151,000 bush., as compared with 483,000 bush. in 1916; and oats, 287,000 bush., against 577,000 bush. (*Broomhall's Corn Trade News*, 7th September.)

Agricultural Conditions in England and Wales on 1st September.

THE Crop Reporters of the Board, in reporting on agricultural conditions in England and Wales on the 1st September, state that August was everywhere wet and windy. The storms appear to have been most severe in the south, especially the south-west, although some progress could be made with the harvest during the middle of the month in many areas. The corn has been very generally laid throughout the country, and the use of machinery in cutting it will be much restricted. Harvesting has been more seriously hindered in the south, where the corn that has not yet been cut is generally over-ripe; while a good deal of hay has been lying out throughout the month. With fine weather, however, harvesting operations would be pushed on rapidly.

The corn harvest generally began throughout the country during August, and probably the bulk has been cut, but in most districts comparatively little has been carted. From most parts sprouting of the grain is reported. Owing largely to the high winds having shaken out a good deal of grain, particularly oats and barley, the prospective yields are not so good as a month ago, while the quality has also generally been affected. None of the corn crops are up to the average, but barley is generally the best and oats the poorest. Prospects are worst in the eastern counties. Beans are a very bad crop, but peas are better, though considerably below the average.

Potatoes are everywhere over average, especially in the eastern counties, although not quite up to the promise of a month ago. They have suffered somewhat from the wet. Disease appears to be prevalent in the south-west; but apart from that area, although it is mentioned in many other parts of the country, there is generally less than usual, and some districts are reported free from it.

Turnips and swedes are average or rather over throughout the west and south, but much under normal on the eastern side of the country from Essex to Northumberland, so that on the whole prospects are for a crop rather below average. Their disappointing appearance in the east is largely due to the difficulty of obtaining a plant earlier in the summer, and to damage by fly. In some parts of the country the rains during August have improved the crop, but in others it has been too wet for these roots. Mangolds are universally promising, and this is the only crop to show improvement during the month. All roots would now be much benefited by sunshine.

The gales have blown down much fruit all over the country. Nevertheless, the quantity of apples, pears, and plums is still large, particularly the two latter.

Hops have been a good deal blown about by the winds, and the sunless weather has been against them. Insect attacks have not been so prevalent as usual, and comparatively little washing has been required. On the whole, therefore, this crop has not very greatly deteriorated during the month, and practically an average yield is expected.

Pastures have now plenty of grass, which has grown well during the month, but it is frequently sodden and generally of poor quality. Warm weather would improve it. Partly owing to the condition of the grass, cattle have only done moderately during the month; while the bad weather has affected sheep more decidedly.

Labour is still short, but the deficiency has hardly been so acute during August as in some recent months, as, with the assistance of soldiers, women, and schoolboys, farmers have managed to keep pace with the work. Cleaning of root fields has, however, been much neglected; and with the pressure of harvest work, as soon as the fine weather permits, the deficiency is expected to be seriously felt, especially of men able to use the scythe, of whom more than usual may be wanted owing to so much of the corn being beaten down.

Summarising the returns, and expressing an average crop by 100, the appearance of the crops on 1st September indicated probable yields which may be expressed by the following percentages: Wheat, 93; barley, 97; oats, 90; beans, 80; peas, 91; potatoes, 104; turnips and swedes, 96; mangolds, 103; hops, 99.

Agricultural Labour in England and Wales during August.

THE following local summaries give further details regarding labour in the different districts of England and Wales:—

Northumberland, Durham, Cumberland, and Westmorland.—Much help is being given by soldiers, but with the corn badly laid, the supply of labour will be deficient for the harvest.

Lancashire and Cheshire.—Labour is very scarce, and the deficiency will probably be still more felt when harvesting is in full swing.

Yorkshire.—In some districts the supply of labour is very deficient, but with increased help from soldiers and women the position is much improved, and in some districts the supply is equal to the demand.

Shropshire and Stafford.—Labour is scarce, but soldiers and schoolboys have eased the situation somewhat.

Derby, Nottingham, Leicester, and Rutland.—The position shows little change from the last report. The lack of skilled labour is keenly felt, but farmers are able to manage with the assistance of soldiers and women.

Lincoln and Norfolk.—Labour is generally short, but not so seriously as of late. Women and soldiers have been of much assistance.

Suffolk, Cambridge, and Huntingdon.—Labour generally is very scarce, although the light crops have somewhat counterbalanced the deficiency, and material assistance has been rendered by soldiers, women and boys.

Bedford, Northampton, and Warwick.—Labour is short, but women and soldiers are assisting farmers considerably.

Buckingham, Oxford, and Berkshire.—With the help of women and soldiers the shortage in the supply of labour is not being very much felt as a rule.

Worcester, Hereford, and Gloucester.—The supply of labour is generally short, but the deficiency has been met to some extent by the employment of soldiers and women.

Cornwall, Devon, and Somerset.—Labour is very short, and as machinery can be so little used for harvesting the scarcity will be severely felt. Where the soldiers and women are not skilled it is feared that there will be much grain lost. In some districts the scarcity is said to be not quite so acute as last year.

Dorset, Wiltshire, and Hampshire.—The supply of labour is short, but considerable help has been given by women and soldiers.

Surrey, Kent, and Sussex.—The supply of labour is deficient, but the shortage has been made up by the employment of women and children. Difficulty is experienced in obtaining labour for cutting the laid corn with the scythe.

Essex, Hertford, and Middlesex.—The position cannot be defined as acute. Civilian labour is very deficient generally, but farmers much appreciate soldier assistance, and material help has been rendered by women and boys.

North Wales.—If an immediate spell of favourable weather comes, shortage of labour for harvesting operations will be seriously felt. Women and soldiers are rendering assistance to farmers.

Mid-Wales.—Labour is scarce.

South Wales.—Labour is everywhere short, and it is anticipated that it will be difficult to obtain labourers capable of using the scythe to cut the laid corn.

Prevalence of Animal Diseases on the Continent.

THE following statement shows that according to the information in the possession of the Board on 1st September, 1917, certain diseases of animals existed in the countries specified :—

Denmark (*month of June*).—Anthrax, Swine Erysipelas, Swine Fever.

France (*for the period 22nd July—4th August*).—Anthrax, Black-leg, Foot-and-Mouth Disease, Glanders and Farcy, Rabies, Swine Erysipelas, Swine Fever.

Holland (*month of July*).—Anthrax, Foot-rot, Glanders, Swine Erysipelas.

Italy (*for the period 30th July—5th August*).—Anthrax, Black-leg, Foot-and-Mouth Disease (676 outbreaks), Glanders and Farcy, Rabies, Sheep-scab, Swine Fever.

Norway (*month of June*).—Anthrax, Black-leg.

Russia (*month of January*).—Anthrax, Cattle-plague, Foot-and-Mouth Disease (12,393 animals), Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Swine-fever, Swine Erysipelas.

Spain (*month of April*).—Anthrax, Black-leg, Dourine, Glanders and Farcy, Pleuro-pneumonia, Rabies, Sheep-pox, Sheep-scab, Swine Erysipelas, Tuberculosis.

Sweden (*month of July*).—Anthrax, Black-leg, Swine Fever.

Switzerland (*for the period 6th—12th August*).—Anthrax, Black-leg, Swine Fever.

No further returns have been received in respect of the following countries: Austria, Belgium, Bulgaria, Germany, Hungary, Montenegro, Rumania, Serbia.

The Weather in England during August.

District.	Temperature.		Rainfall.				Bright Sunshine.	
	Daily Mean.	Diff. from Average.	Amount.		Diff. from Average.	No. of Days with Rain.	Daily Mean.	Diff. from Average.
	°F.	°F.	In.	Mm.*	Mm.*		Hours.	Hours.
Week ending 4th Aug.:								
England, N.E. ...	57·3	—1·9	1·23	31	+18	5	1·8	—4·1
England, E.	58·8	—2·1	3·31	84	+74	7	1·0	—5·7
Midland Counties ...	57·9	—2·1	1·19	30	+17	5	0·8	—5·1
England, S.E. ...	58·6	—2·8	3·52	89	+79	7	0·4	—6·6
England, N.W. ...	58·8	—0·3	0·19	5	—15	3	4·2	—1·6
England, S.W. ...	58·8	—1·0	0·74	19	+ 2	3	6·3	—0·1
English Channel ...	59·7	—1·9	0·86	22	+10	4	4·2	—4·2
Week ending 11th Aug.:								
England, N.E. ...	61·3	+2·7	1·39	35	+21	5	4·5	—1·0
England, E.	62·2	+1·6	0·56	14	+ 2	4	5·2	—1·0
Midland Counties ...	61·8	+2·1	1·48	38	+25	5	4·4	—1·2
England, S.E. ...	61·8	+0·3	0·60	15	+ 5	4	5·5	—1·1
England, N.W. ...	60·9	+2·1	0·90	23	+ 4	4	4·3	—1·1
England, S.W. ...	60·8	+0·7	1·51	38	+22	5	5·6	—0·6
English Channel ...	61·5	—0·5	0·97	25	+11	4	6·6	—1·4
Week ending 18th Aug.:								
England, N.E. ...	59·0	+2·3	1·23	31	+16	6	4·9	—0·3
England, E.	62·0	+1·8	0·41	10	— 2	4	6·6	+0·3
Midland Counties ...	60·9	+1·6	0·97	25	+11	6	5·2	—0·3
England, S.E. ...	61·8	+0·7	0·48	12	— 5	5	7·4	+0·6
England, N.W. ...	59·7	+1·2	2·17	55	+36	6	4·1	—1·2
England, S.W. ...	60·2	+0·7	0·97	25	+ 7	6	5·6	—0·8
English Channel ...	61·5	—0·3	0·88	22	+ 8	6	8·0	+0·3
Week ending 25th Aug.:								
England, N.E. ...	59·7	+2·0	0·35	9	— 8	5	6·1	+1·2
England, E.	61·2	+1·4	0·22	6	— 8	4	7·7	+2·1
Midland Counties ...	59·5	+0·9	0·51	13	— 4	5	6·1	+0·9
England, S.E. ...	60·9	+0·5	0·35	9	— 6	4	8·0	+1·8
England, N.W. ...	59·0	+0·9	1·07	27	+ 3	6	5·1	+0·1
England, S.W. ...	58·8	—0·3	1·44	37	+15	6	4·5	—1·4
English Channel ...	60·9	—0·3	0·69	18	+ 2	4	8·8	—1·6

* 1 inch=2·54 millimetres.

DISEASES OF ANIMALS ACTS, 1894 to 1914.

NUMBER OF OUTBREAKS, and of ANIMALS Attacked or Slaughtered.

GREAT BRITAIN.

(From the Returns of the Board of Agriculture and Fisheries.)

DISEASE.	AUGUST.		EIGHT MONTHS ENDED AUGUST.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	11	21	322	366
Animals attacked	13	29	370	435
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	1
Animals attacked	—	—	—	24
Glanders (including Farcy):—				
Outbreaks	2	3	18	35
Animals attacked	4	6	32	90
Parasitic Mange:—				
Outbreaks	116	89	1,850	1,679
Animals attacked	197	148	3,609	3,789
Sheep-Scab:—				
Outbreaks	4	4	395	182
Swine Fever:—				
Outbreaks	112	263	1,687	3,233
Swine slaughtered as diseased or exposed to infection	52	204	732	8,589

IRELAND.

(From the Returns of the Department of Agriculture and Technical Instruction for Ireland.)

DISEASE.	AUGUST.		EIGHT MONTHS ENDED AUGUST.	
	1917.	1916.	1917.	1916.
Anthrax:—				
Outbreaks	—	—	3	3
Animals attacked	—	—	5	7
Foot-and-Mouth Disease:—				
Outbreaks	—	—	—	—
Animals attacked	—	—	—	—
Glanders (including Farcy):—				
Outbreaks	—	—	1	—
Animals attacked	—	—	1	—
Parasitic Mange:—				
Outbreaks	5	4	37	47
Sheep-Scab:—				
Outbreaks	22	25	261	273
Swine Fever:—				
Outbreaks	18	25	174	219
Swine slaughtered as diseased or exposed to infection	63	118	1,043	1,233

PRICES OF AGRICULTURAL PRODUCE.

AVERAGE PRICES of LIVE STOCK in ENGLAND and WALES in August and July, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	August.		July.	
	First Quality.	Second Quality.	First Quality.	Second Quality.
FAT STOCK :—	per stone.*	per stone.*	per stone.*	per stone.*
Cattle :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Polled Scots	18 3	17 8	19 7	18 3
Herefords	17 8	16 2	18 11	17 4
Shorthorns	18 0	16 5	19 1	17 5
Devons	18 0	16 5	18 9	17 4
Welsh Runts	—	16 7	—	16 9
	per lb.*	per lb.*	per lb.*	per lb.*
	d.	*d.*	*d.*	*d.*
Veal Calves	16	14	17	15
Sheep :—				
Downs	16¾	15¼	17⅓	16¼
Longwools	15½	14¼	16¼	15
Cheviots	16¼	15½	18	16½
Blackfaced	16¼	14⅓	17	15¾
Welsh	14¼	13¾	16¼	15
Cross-breds	16¾	15	17¼	15¾
	per stone.*	per stone.*	per stone.*	per stone.*
Pigs :—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Bacon Pigs	17 4	16 5	16 9	15 9
Porkers	17 7	16 9	17 3	16 4
LEAN STOCK :—	per head.	per head.	per head.	per head.
Milking Cows :—	£ *s.*	£ *s.*	£ *s.*	£ *s.*
Shorthorns—In Milk ...	44 9	34 12	44 0	34 17
,, —Calvers ...	42 5	33 12	40 19	33 5
Other Breeds—In Milk ...	44 11	34 1	40 17	33 11
,, —Calvers ...	—	—	30 0	27 0
Calves for Rearing	3 19	2 19	4 4	3 5
Store Cattle :—				
Shorthorns—Yearlings ...	15 18	13 3	16 15	14 9
,, —Two-year-olds...	24 12	19 19	26 14	22 2
,, —Three-year-olds	—	24 12	35 5	31 9
Herefords —Two-year-olds...	27 14	22 16	27 10	25 0
Devons— ,,	26 12	22 14	26 17	22 18
Welsh Runts— ,,	—	—	26 7	21 7
Store Sheep :—				
Hoggs, Hoggets, Tegs, and Lambs—	*s. d.*	*s. d.*	*s. d.*	*s. d.*
Downs or Longwools ...	58 9	48 10	63 0	50 0
Store Pigs :—				
8 to 12 weeks old	34 5	25 1	35 8	26 6
12 to 16 ,, ,, ...	57 7	45 0	57 3	46 3

* Estimated carcass weight.

AVERAGE PRICES of DEAD MEAT at certain MARKETS in ENGLAND in August, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	Quality.	Birmingham.	Leeds.	Liverpool.	London.	Manchester.
		per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
		s. d.	s. d.	s. d.	s. d.	s. d.
BEEF :—						
English	1st	128 0	125 0	—	128 0	121 0
	2nd	119 6	118 6	—	118 6	115 0
Cow and Bull	1st	110 0	117 0	110 0	105 6	105 6
	2nd	101 0	111 0	87 0	96 0	98 0
Irish : Port Killed	1st	—	—	126 6	123 0	116 6
	2nd	—	107 6	113 0	114 0	110 0
Argentine Frozen—						
Hind Quarters	1st	127 0	—	—	—	—
Fore ,, ...	1st	99 6	—	—	—	—
Argentine Chilled—						
Hind Quarters	1st	136 0	121 6	129 0	132 0	129 0
Fore ,, ...	1st	107 6	95 6	104 0	102 6	104 0
American Chilled—						
Hind Quarters	1st	128 6	133 0	121 6	136 0	121 6
Fore ,, ...	1st	98 0	100 6	98 0	103 0	98 0
VEAL :—						
British	1st	121 6	130 6	114 0	136 6	115 0
	2nd	110 0	121 6	93 6	117 6	93 6
Foreign...	1st	—	—	—	—	—
MUTTON :—						
Scotch	1st	135 6	142 0	—	144 6	133 6
	2nd	123 0	132 6	—	135 6	127 0
English...	1st	139 0	141 0	—	140 0	126 0
	2nd	130 6	129 6	—	130 6	121 6
Irish : Port Killed	1st	133 6	—	128 0	135 6	125 0
	2nd	125 0	—	114 0	126 0	115 6
Argentine Frozen	1st	95 6	95 6	95 6	93 6	95 6
New Zealand ,, ...	1st	86 6	—	87 6	87 6	87 6
Australian ,, ...	1st	—	—	—	—	—
LAMB :—						
British	1st	139 0	143 6	139 0	150 6	141 0
	2nd	134 0	134 6	116 6	141 0	134 6
New Zealand	1st	100 6	100 6	98 6	98 0	98 6
Australian	1st	100 6	100 6	98 0	98 0	98 0
Argentine	1st	105 0	105 0	105 0	102 6	105 0
PORK :—						
British	1st	140 0	136 6	140 0	139 0	140 0
	2nd	134 6	121 6	128 0	129 6	121 6
Frozen	1st	109 0	108 0	116 6	118 0	106 0

AVERAGE PRICES of PROVISIONS, POTATOES and HAY at certain MARKETS in ENGLAND in August, 1917.

(Compiled from Reports received from the Board's Market Reporters.)

Description.	BRISTOL.		LIVERPOOL.		LONDON.	
	First Quality.	Second Quality.	First Quality.	Second Quality.	First Quality.	Second Quality.
BUTTER :—	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.	*s. d.* per 12 lb.
British	—	—	—	—	24 0	23 0
	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.	per cwt.
Irish Creamery—Fresh	213 0	210 0	214 0	211 6	216 0	212 0
,, Factory	195 0	189 6	197 6	192 6	201 0	194 0
Danish	...	—	—	—	—	—
French	—	—	—	—	217 0	210 6
Dutch	—	—	—	—	204 0	196 0
Australian	206 6	203 0	—	—	209 6	205 6
New Zealand	206 6	203 6	—	—	210 0	206 0
Argentine	—	—	—	—	205 6	202 0
CHEESE :—						
British—						
Cheddar	138 0	—	—	—	140 0	—
			120 lb.	120 lb.	120 lb.	120 lb.
Cheshire	—	—	145 6	142 6	146 0	—
			per cwt.	per cwt.	per cwt.	per cwt.
Canadian	130 6	—	130 6	—	130 6	—
BACON :—						
Irish (Green)	159 0	157 0	—	—	160 0	158 0
Canadian (Green sides)	—	—	150 0	145 0	151 6	150 0
HAMS :—						
York (Dried or Smoked)	—	—	—	—	188 0	180 0
Irish (Dried or Smoked)	—	—	—	—	173 6	167 6
American (Green) (long cut)	135 0	133 0	136 0	134 6	136 6	134 0
EGGS :—	per 120.	per 120.	per 120.	per 120.	per 120.	per 120.
British	—	—	—	—	27 1	24 9
Irish	24 11	—	24 7	23 2	25 0	24 0
Danish	—	—	—	—	25 2	23 2
POTATOES :—	per ton.	per ton.	per ton.	per ton.	per ton.	per ton.
Duke of York	146 6	126 6	—	—	136 6	123 6
White Kidney ...	128 6	108 6	163 6	140 0	130 0	113 6
Other First Earlies ...	151 6	108 6	138 6	118 6	121 6	106 6
HAY :—						
Clover	—	—	150 0	136 0	141 0	132 0
Meadow	—	—	—	—	141 0	132 0

AVERAGE PRICES of **British Corn** per Quarter of 8 Imperial Bushels, computed from the Returns received under the Corn Returns Act, 1882, in each Week in 1915, 1916 and 1917.

Weeks ended (*in* 1917).	WHEAT.						BARLEY.						OATS.					
	1915.		1916.		1917.		1915.		1916.		1917.		1915.		1916.		1917.	
	s.	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*	*s.*	*d.*
Jan. 6 ...	46	2	55	8	76	0	29	7	47	8	66	4	26	5	31	5	47	1
,, 13 ...	48	9	56	7	75	8	30	5	48	6	65	7	27	6	31	11	47	2
,, 20 ...	51	6	57	2	75	8	31	3	49	6	64	9	28	10	32	6	47	4
,, 27 ...	52	8	58	0	75	10	32	5	51	0	64	5	29	10	32	11	47	8
Feb. 3 ...	53	3	58	3	75	10	33	7	52	5	64	0	30	3	32	4	47	3
,, 10 ...	54	8	57	6	76	0	34	7	52	10	63	5	31	1	32	2	46	11
,, 17 ...	56	0	56	11	76	3	34	11	53	6	63	8	31	5	31	9	47	3
,, 24 ...	56	0	58	2	76	9	35	3	54	2	63	9	31	8	32	2	47	8
Mar. 3 ...	55	11	59	4	77	4	34	6	55	7	64	0	31	8	32	4	48	0
,, 10 ...	54	8	58	2	78	0	33	5	55	6	63	7	31	0	32	3	48	7
,, 17 ...	53	9	57	9	78	10	32	2	55	4	64	1	30	7	31	10	49	4
,, 24 ...	54	3	55	11	80	3	31	11	54	6	65	6	30	6	31	4	50	4
,, 31 ...	54	6	53	6	81	5	31	9	53	8	71	10	30	6	30	5	51	10
Apl. 7 ...	54	9	51	8	84	4	31	3	53	7	69	11	30	4	30	1	55	1
,, 14 ...	55	4	53	2	85	2	30	10	53	1	71	10	30	5	30	7	57	2
,, 21 ...	56	5	55	3	84	10	31	5	52	10	70	6	30	11	31	8	59	8
,, 28 ...	58	3	56	3	81	1	32	7	53	5	69	5	31	5	32	4	58	6
May 5 ..	60	5	55	7	77	7	33	3	53	1	64	4	32	4	32	10	54	9
,, 12 ...	61	7	55	5	78	0	34	0	53	5	64	11	32	5	33	1	55	2
,, 19 ...	62	0	55	0	77	11	34	1	52	10	64	10	32	8	33	0	55	2
,, 26 ...	61	11	54	7	78	0	34	8	52	9	64	9	32	7	33	4	54	11
June 2 ...	61	9	53	3	78	0	35	4	53	9	65	11	32	5	33	3	54	11
,, 9 ...	60	1	51	2	78	0	34	5	52	8	67	7	32	4	32	7	55	0
,, 16 ...	56	1	48	10	78	2	34	3	50	9	75	6	31	9	32	1	55	1
,, 23 ...	52	0	47	6	78	1	34	4	49	10	75	0	31	9	31	3	55	2
,, 30 ...	49	5	46	3	78	3	35	3	49	1	73	11	31	1	30	10	55	1
July 7 ...	50	1	46	3	78	1	34	7	45	6	69	5	31	6	30	8	55	2
,, 14 ...	52	7	48	11	78	2	35	8	47	5	70	10	31	6	31	6	55	1
,, 21 ...	53	10	51	6	78	3	35	10	48	8	72	1	32	1	32	3	55	2
,, 28 ...	55	3	53	5	78	3	36	1	47	2	65	7	31	1	32	5	55	2
Aug. 4 ...	55	4	55	1	78	2	35	7	46	1	73	6	31	5	32	9	55	0
,, 11 ...	55	2	56	7	78	4	37	0	46	11	76	1	31	7	31	2	55	0
,, 18 ...	54	3	58	1	78	7	39	4	48	0	68	11	31	4	30	8	55	6
,, 25 ...	51	11	59	0	76	7	38	3	47	1	70	7	30	0	31	6	54	7
Sept. 1 ...	45	3	59	4	72	1	38	1	48	5	60	4	26	10	30	5	49	0
,, 8 ...	43	0	59	3	71	6	37	11	51	7	59	3	26	8	31	1	46	7
,, 15 ...	42	9	59	11			39	0	52	6			26	4	30	9		
,, 22 ...	43	3	59	4			39	8	53	3			26	1	30	9		
,, 29 ...	43	5	58	10			40	4	54	1			26	5	31	1		
Oct. 6 ...	44	1	59	2			41	0	54	5			26	5	30	9		
,, 13 ...	45	9	59	7			42	3	53	10			27	1	31	6		
,, 20 ...	48	2	60	9			44	0	53	8			28	1	31	11		
,, 27 ...	50	3	62	10			46	2	54	6			29	1	32	10		
Nov. 3 ...	51	6	66	7			47	3	56	2			30	4	34	0		
,, 10 ...	52	8	69	8			47	5	58	0			30	11	35	8		
,, 17 ...	53	6	70	9			47	11	59	8			31	3	37	8		
,, 24 ...	54	2	70	8			48	7	61	8			31	1	39	7		
Dec. 1 ...	53	7	71	3			48	11	63	1			30	11	41	4		
,, 8 ...	52	10	72	1			47	10	65	6			30	4	44	1		
,, 15 ...	53	11	73	2			47	5	66	5			30	6	45	10		
,, 22 ...	53	10	74	8			47	2	67	3			30	7	46	5		
,, 29 ...	54	9	75	10			47	5	67	5			30	10	47	4		

NOTE.—Returns of purchases by weight or weighed measure are converted to Imperial Bushels at the following rates: Wheat, 60 lb.; Barley, 50 lb.; Oats, 39 lb. per Imperial Bushel.

AVERAGE PRICES of **British Wheat, Barley,** and **Oats** at certain Markets during the Month of August, 1915, 1916, and 1917.

	WHEAT.			BARLEY.			OATS.		
	1915.	1916.	1917.	1915.	1916.	1917.	1915.	1916.	1917.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
London ...	54 0	58 5	78 2	40 11	49 2	64 1	31 11	32 6	55 7
Norwich ...	54 4	56 0	77 11	—	44 7	64 9	29 0	32 0	54 9
Peterborough	52 4	57 0	77 11	37 7	43 4	65 11	31 0	31 0	55 3
Lincoln ...	53 11	58 7	78 0	36 7	—	—	32 4	33 5	—
Doncaster ...	53 7	57 0	78 0	35 9	—	—	31 10	32 10	54 11
Salisbury ...	54 11	57 8	78 1	36 11	46 3	72 4	30 11	31 0	55 0

SELECTED CONTENTS OF PERIODICALS.

Agriculture, General and Miscellaneous—

In-Breeding, *A. B. Bruce.* (Jour. Genetics, April, 1917.) [575.1.]

Influence of Crop, Season, and Water on the Bacterial Activities of the Soil, *J. E. Greaves, et al.* (Jour. Agric. Research, 28th May, 1917.) [63.115.]

The Solubility of Calcium Phosphates in Citric Acid, *A. A. Ramsay* [63.1672.] The Fixation of Nitrogen in Fæces, *E. H. Richards.* [63.163.] The Shrinkage of Soils, *H. A. Tempany.* [63.113.] Studies on the Palæozoic Soils of North Wales, *G. W. Robinson.* [63.111.] The Influence of Soil Conditions on the Decomposition of Organic Matter in the Soil, *E. J. Russell* and *A. Appleyard.* (Jour. Agric. Sci., June, 1917.) [63.113.]

On Making and Storing Farmyard Manure, *E. J. Russell.* (Jour. Roy. Agric. Soc., 1916.) [63.163.]

Some Conditions Affecting the Value of Calcium Cyanamide as a Manure, *T. D. Mosscrop.* (Jour. Agric. Sci., March, 1917.) [63.1671.]

A Review of Investigations in Soil Protozoa and Soil Sterilisation, *N. Kopeloff* and *D. A. Coleman.* (Soil Science, March, 1917.) [63.115.]

Relation of the Water-retaining Capacity of a Soil to its Hygroscopic Co-efficient, *F. J. Alway* and *G. R. McDole.* (Jour. Agric. Research, 9th April, 1917.) [63-113.]

Artificial Fertilisers: Their Present Use and Future Prospects, *E. J. Russell.* (Jour. Soc. Chem. Industry, 15th March, 1917.) [63.162.]

Bacteriological Studies of a Soil subjected to Different Systems of Cropping for 25 years, *P. L. Gainey* and *W. M. Gibbs.* (Jour. Agric. Research, 11th September, 1916.) [63.115.]

Influence of Barnyard Manure and Water upon the Bacterial Activities of the Soil, *J. E. Greaves* and *E. G. Carter.* (Jour. Agric. Research, 4th September, 1916.) [63.163.]

Soil Fungi and their Activities, *S. A. Waksman.* (Soil Science, Vol. II., No. 2, August, 1916.) [63.115.]

Influence of Calcium and Magnesia in Compounds on Plant Growth, *F. A. Wyatt.* (Jour. Agric. Research, 17th July, 1916.) [63.15; 63.161.]

Field Crops—

Uber die chilenische Reismelde (*Chenopodium Quinoa,* L.) eine neue Getreide- und Wildfutter-pflanze, *A. Krausse.* (Zeit. Forst. u. Jagd, März, 1917.) [63.511.]

Some Minor Farm Crops, IV. Maize as a Fodder Crop, *K. J. J. Mackenzie.* (Jour. Roy. Agric. Soc., 1916.) [63.33(*d*); 63.315.]

West Country Grasslands, *W. E. Brenchley.* (Jour. Bath and West and S. C. Soc., 1916–1917.) [63.33(*a*).]

Der Anbau der Brennessel (*Urtica Dioica*), *Dr. O. Richter.* (Natur. Zeit. Forst u. Land., Januar, 1917.) [63.341.]

Minor Agricultural Industries, IV., Culinary Herbs, *W. Dallimore.* (Roy. Bot. Gard. Kew, Bull., No. 8, 1916.) [63.511.]

Effect of Climatic Factors on the Hydrocyanic Acid Content of Sorghum, *J. J. Willaman* and *R. M. West.* (Jour. Agric. Research, 15th May, 1916.) [63.319.]

Horticulture—

Sources of Supply of Hazel-Nuts. (Bull. Imp. Inst., Vol. XIV., No 2, April–June, 1916.) [63.41(*d*).]

Piping System for Orchard Spraying, *G. P. Weldon.* (Monthly Bull. California State Comm. Hort., August, 1916.) [63.294.]

Plant Diseases—

The Practical Use of the Insect Enemies of Injurious Insects, *L. O. Howard.* (Year-book, U.S. Dept. Agric., 1916.) [63.296.]

Effects of Nicotine as an Insecticide, *N. E. McIndoo.* (Jour. Agric. Research, 16th October, 1916.) [63.295.]

Die Getreide blumenfliege (*Hylemyia coarctata* Fall.) Ein Beitrag zur Kenntnis ihrer Biologie und ihrer Bedeutung für die Landwirtschaft, *R. Kleine.* (Zeit. für angew. Entomologie, Bd. II., 1915.) [63.27.]

The Disease of Potatoes known as "Leak" [caused by *Pythium debaryanum*], *L. A. Hawkins.* (Jour. Agric. Research, 24th July, 1916.) [63.24.]

Studies in the Physiology of Parasitism, II. Infection by *Botrycis cinerea*, *V. H. Blackman* and *E. J. Welsford.* III., On the Relation between the "Infection Drop" and the Underlying Host Tissue, *W. Brown.* (Ann. Botany, July, 1916.) [63.24(04).]

Live Stock—

The Dietetic Value of Wheat Bran, *R. G. Linton.* (Vet. Jour., June, 1917.) [63.604(*a*).]

Some Maize By-Products, *R. G. Linton.* (Vet. Jour., Aug., 1917.) [63.604(*a*).]

Physiological Effect on Growth and Reproduction of Rations Balanced from Restricted Sources, *E. B. Hart, et al.* (Jour. Agric. Research, 23rd July, 1917.) [612.394.]

Welsh Black Cattle, *Prof. C. Bryner Jones.* (Jour. Roy. Agric. Soc., 1916.) [63.62.]

Palm Kernel Cake and Meal, *C. Crowther.* (Jour. Roy. Agric. Soc., 1916.) [63.604.]

Some Practical Questions Relating to the Pig Industry, *James Long.* (Jour. Bath and West and S. C. Soc., 1916–17.) [63.64(04).]

Dairying and Food, General—

Studies in Milk Secretion. I. The Effect of Nutrition on Yield and Composition. II. The Relation of the Glands, *J. Hammond* and *J. C. Hawk.* (Jour. Agric. Sci., March, 1917.) [63.711(*a*).]

Birds, Poultry, and Bees—

Studies on the Physiology of Reproduction in the Domestic Fowl.—XV. Dwarf Eggs, *R. Pearl* and *M. R. Curtis.* (Jour. Agric. Research, 18th September., 1916.) [63.651(04).]

Die Ausbildung des Geschlechtes bei der Honigbiene. I. Die postembryonale Entwicklung des Geschlectapparates, *E. Zander.* (Zeit. für angew. Entomologie, Bd. III. Heft 1, März, 1916.) [63.81(04).]

Forestry—

Anleitung zur Gewinnung der Buchmast des Jahres, 1916, *von Oertzen.* (Natur. Zeit. für Forst-und Landwirtschaft, Heft 7 & 8, 1916.) [63.49-197.]

Economics—

Agricultural Production, *A. W. Ashby.* (Edinburgh Rev., April, 1917.) [338.1.]

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No. 16.—I. Some Aspects of the Dairying Industry of England and Wales

II. The Cost of Milk Production Sept., 1916

THIS paper was written before the provisions of the Corn Production Bill were made public. It is of the utmost importance that farmers in cattle-rearing districts, now largely under grass, should realise the indirect as well as the direct benefits that they may derive by responding whole-heartedly to the Nation's call.

An endeavour has been made to show that by ploughing up large areas of poor grass the farmer has the opportunity of converting inferior grazing into productive temporary leys, and by adopting a more intensive system of farming he may, besides growing an extended acreage of corn, add considerably to his cattle output.

The period covered by the Corn Production Bill is sufficient for the grazier to establish a regular sequence of high-class leys, and therefore, apart altogether from any question of the continuance or termination of guaranteed prices, the far-sighted farmer should be in a better position with reference to cattle production than formerly. It must be pointed out that by resort to adequate seeds mixtures and the inclusion of wild white clover, a good sward can be obtained with a degree of certainty and rapidity that makes the breaking up of grass land a very different proposition for the modern farmer than it was for his predecessor of a generation ago. The recommendations made under " Improvement by Breaking the Turf " contemplate more particularly land not well adapted to the production of wheat. On land naturally suited to arable farming a continuous succession of crops can be maintained, except on occasion when a summer fallow may be desirable.

There is, however, just as much scope for summer ploughing on less fertile soils. It is, moreover, this aspect of the breaking up of grass land, with the two-fold object of its ultimate improvement and the current production of crops, that needs to be brought home to the grazier if it is hoped to induce him to plough a really substantial proportion of his unproductive grass.

BOARD OF AGRICULTURE AND FISHERIES,

May, 1917.

CONTENTS.

	PAGE
INTRODUCTION	5
TYPES OF GRASS LAND—	
Permanent Grass	6
Outrun Grass	9
Leys	9
THE IMPROVEMENT OF GRASS LAND—	
General Considerations	10
Practical Methods	10
Top Dressings	11
Renovating Mixtures	13
Altered Methods of Stocking	14
Substituting Pasture for Meadow Conditions, or the Reverse	15
Eradication of Weeds	16
Drainage	18
IMPROVEMENT BY BREAKING THE TURF	18
SEED MIXTURES—	
The Grasses	27
The Clovers	29
Miscellaneous Plants	32
Types of Seed Mixtures	32
THE PURCHASE OF SEED	36
SUMMARY OF CONCLUSIONS	36
REFERENCES	38

GRASS LAND AND PLOUGHED LAND.

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INTRODUCTION.

The need for an increased output of home-grown food demands that the question of our grass land in relation to production should receive the careful and unbiassed consideration of the agricultural community. It is manifest that the Nation's new call for cereals and potatoes should, as far as possible, be permanently met without unduly diminishing the stocks of cattle and sheep in the country. Much has been written in the agricultural press against an extensive policy of breaking up grass land. It is, however, too often assumed that all grass lands are alike; it must be constantly born in mind that much of the grass in this country is so inferior that if ploughed and turned to arable account the loss to the grazier would be almost negligible. It should be remembered also that an arable rotation can be made to provide both summer and winter keep for stock, and that by resort to a certain amount of catch-cropping the grazing from the rotation may be materially extended.

In this country, however, with its varied geological and climatic conditions, there are many districts where—even under a greatly improved system of agriculture—grass will for a long time to come take a prominent, although no longer overwhelming, position in the methods of farming practised. A maximum increase in our food supplies can therefore only be obtained if endeavours to extend the area under the plough go hand in hand with plans for the improvement of grass land.

The principle of co-ordinated grass land improvement and arable extension should be applied to both individual farmers

and to localities as a whole. A farmer in a grass-land district who decides to break, say, five acres should consider plans for improving an equal area of his remaining grass. If the general policy adopted by Essex, for instance, is to revert to wheat growing on a wholesale scale, that of Cardiganshire or other county of high rainfall should be both to extend its cattle output and to aim at becoming practically self-supporting in the matter of concentrated feeding stuffs. This would demand an extensive scheme of grass land improvement and some modification in the rotations subservient to cattle production.

In the past the tendency has been to regard the improvement of grass land as one aspect of husbandry and the growing of good arable crops as another. The work of Somerville, Gilchrist and others, on the value of basic slag and wild white clover has, however, clearly shown the relation that exists between a good turf ploughed down whilst still full of clover and high arable farming. It must be insisted, therefore, that the improvement of grass land is not an end in itself; it does not merely entail top dressings and kindred treatments, but may demand for its attainment a more or less complete modification in the methods of husbandry and should under clever management re-act on the fertility of the whole farm.

TYPES OF GRASS LAND.

Before passing to detailed consideration of the various methods of improvement it will be necessary to devote a short section to types of grass land. Grass land in Britain may be classified as (*a*) Permanent, (*b*) Outrun, and (*c*) Leys.

(*a*) **Permanent Grass.**—Properly considered, permanent grass includes fields that have been down for over twenty years—much of the best grass in the country has been down for over 100 years. Permanent grass is usually made the subject of restrictive covenants in leases. Permanent grass varies very much in quality from locality to locality. It ranges from the famous fattening pastures of Northamptonshire and adjacent counties, capable of fattening a beast per acre without added feeding stuffs, to rush and sedge pastures or mountain and hill grazing capable of carrying a few store cattle or sheep and ponies only. The essential characteristic of all permanent grass is that it is natural or semi-natural. That is to say, the herbage consists almost entirely of indigenous species that are proper to the various conditions of soil and climate. These indigenous species take time to

establish themselves; and selection in favour of the more desirable plants is exercised by the scientific application of adequate manures, and judicious stocking. It is for this reason that permanent grass has, perhaps, acquired an exaggerated reputation in the eyes of both landlords and tenants.

The better classes of permanent grass would seem, in part at least, to owe their quality to the fact that perennial rye-grass, meadow fescue, rough-stalked meadow-grass and meadow foxtail are indigenous on many of the more fertile soils, and usually take a predominant place in the herbage. Yorkshire fog is, however, frequently abundant on high-class grass lands, especially on soils which are retentive of moisture. Crested dog's-tail and sweet vernal grass, with smooth-stalked meadow-grass and the various fine-leaved fescues, usually take a more prominent place in second-class grass lands, on which perennial rye-grass does not usually contribute more than 15 to 20 per cent. to the herbage, and the other valuable species are but slightly represented. The poorest classes of grass, devoted chiefly to carrying store cattle and sheep, consist for the most part of bent (*Agrostis*), sheep's fescue and heath grass, with sweet vernal grass (on the wetter situations), soft brome (on dry situations) and small amounts of crested dog's-tail.*

An abundance of white clover has been shown by Carruthers, Fream, and Armstrong† to be an important characteristic of all the best permanent grass. White clover is, however, an indigenous plant which contributes in varying amount to the herbage on the great majority of grass lands. Wild red clover is natural on some classes of superior and poor grass alike. Other leguminous herbs met with on natural and semi-natural grass land are the meadow and mountain vetchling, bird's-foot trefoil, yellow suckling clover, trefoil and sometimes also the tufted vetch. Since the valuable grasses occur abundantly on first-rate permanent grass, it is often assumed that an equally good herbage can be established on poor soils by the indiscriminate introduction of the seed of these plants. The improvement of permanent grass is not, however, best achieved by this means. The aim should rather be to make poor soils more fertile, and therefore better suited to the valuable grasses, when the appropriate indigenous species will sooner or later make a natural appearance.

* Types of grass land are considered in more detail by Stapledon & Jenkin (18) and references to literature are given.

† See, *e.g.*, Armstrong (2), Fream (6), and Carruthers (3).

The case of white clover is different to that of the grasses, since it is indigenous to some extent on nearly all types of grass land. The introduction of the seed of wild white clover (the indigenous species) will therefore hasten the appearance of this plant, and is consequently a potent factor in the improvement of the most inferior grass lands on the poorest of soils.

It is usually only possible to alter any particular class of grass land in the direction of the class next better than itself in the scale. The poorest types, such as some mountain and hill grazing, may thus be converted into tolerable pastures with white clover, crested dog's-tail, red fescue, and even rough-stalked meadow-grass taking an appreciable place in the herbage. Such an improved hill pasture would be able to carry a greatly increased and more varied head of stock. Grass now only carrying store cattle and sheep with a flora consisting chiefly of bent (*Agrostis*) with some few leguminous plants may, under proper management, be converted into a herbage full of white clover, with crested dog's-tail and red fescue taking a prominent place, and rye-grass and rough-stalked meadow-grass contributing something to the flora. Fields so improved would be able to maintain "forward" animals and would be of some value to the dairy farmer. Similarly, second-class grass may be converted into a herbage capable of carrying larger and better herds of dairy cattle or fattening a beast with the assistance of a certain amount of added feeding stuffs. The "fattening" pastures of course only require proper management for their fertility to be indefinitely maintained. The adoption of this graduated method of grass land improvement would so add to the available herbage of the country that thousands of acres of poor and moderate grass could be brought under an intensive arable rotation without appreciably affecting the grazier.

Large areas under permanent grass are consequently only compatible with sound farming (1) if the grass maintains a high degree of productivity without resort to excessive manuring (*e.g.* the fattening pastures), (2) if the soil is so poor, or the fields so steep or inaccessible that they cannot be made to produce remunerative arable crops, and (3) on the very heavy clays incapable of cultivation.

In districts of poor grass, which require heavy manuring for the productivity to be maintained at a reasonable level, the permanent grass should be restricted to those fields best capable of taking a sward. In these localities the area under

permanent grass should not be greater than the farmer is both prepared and able to manure on a generous scale.

(*b*) **Outrun Grass.**—Outrun grass falls under two distinct categories. It consists of: (1) *Senile Leys*, that is to say, leys that have either tumbled down without sowing from a corn stubble, or owe their origin to an outrun sainfoin breadth or to an inadequate original seeding. They vary in age from three to about fifteen years, have probably not been manured, and usually consist chiefly of Yorkshire fog or soft brome (under meadow conditions) and bent (under pasture conditions). They constitute about the most unproductive class of grass in the whole country. (2) *Outrun Permanent Grass*, or grass that has been allowed to deteriorate gradually under bad management, perhaps owing to lack of attention to the existing drainage systems, to manures being continually withheld, or to prolonged stocking with one class of animal only, or more often owing to the long-continued taking of hay. Outrun permanent grass, like outrun leys, consists chiefly of Yorkshire fog or bent, with excess of weeds such as yellow rattle, knapweed, ribgrass, cat's ear and other mat herbs. In the last resort outrun grass of both types is the heritage of the policy which has led to a diminution in the rural population, amalgamation of farms, more grass, fewer homesteads and less manure.

The position of the country as to outrun grass is the more serious because it owes its origin primarily to neglect and, therefore, occurs on soils that should either be yielding arable crops or much improved grass. The area under this type of grass is also very considerable. The writer has mapped a large tract of country in mid-Wales where the proportion of outrun grass to the total area of tended (as opposed to mountain and hill grazing) land amounts to over 30 per cent. This figure may probably be taken as a fair average for the amount of outrun grass in many other cattle-rearing districts.

(*c*) **Leys.**—Leys are either (1) rotation or (2) temporary meadows or pastures. A rotation ley is usually devised to give one crop of hay and an aftermath; occasionally two year's hay or one hay crop and a subsequent year's grazing. Temporary leys are put down for various periods from three to about eight years. Under conditions of high farming they should only be left down during their period of continuous productivity.

THE IMPROVEMENT OF GRASS LAND: GENERAL CONSIDERATIONS.

It is proposed in this paper to take a broad view of the improvement of grass land. Plans of improvement should aim at obtaining the maximum amount of keep from fields under grass. The possible methods to be employed must therefore not only include drainage, top dressings, renovating mixtures, altered methods of stocking, or re-seeding, but if necessary, also the adoption of considerably modified rotations.

In the case of essentially grass-land and cattle-rearing districts it is remarkable that the rotations practised have not been devised so as to make for maximum productivity from the grass land. There are thousands of acres of land in this country where, no matter how excellent the seed mixtures used, it is impossible to maintain a fully productive herbage for more than about four years—unless manures are employed on practically a prohibitive scale. It is true that the herbage improves after a middle period of great inferiority. Under the system practised in many districts a ley gives a good crop of hay in its first year, begins to deteriorate in the second, is of very poor quality in the third, fourth, and fifth years, and subsequently settles down to an improved but always poor herbage. Now it does not appear to be sound farming to leave a field down for six to eight years in order that a short period of somewhat improved grazing may be obtained. Matters are worse when, as is often the case if manures are wholly withheld, no appreciable improvement comes about. There can, moreover, be no justification for such a system if, by the use of proper seed and adequate manures, it is possible to establish a ley which will maintain unbroken productivity for a period of about four years.

IMPROVEMENT OF GRASS LAND: PRACTICAL METHODS.

The problem for the grass land farmer consists of three parts :—

(*a*) How with the labour and machinery at his disposal to extend his rotation land to stand in a reasonable and economic relation to his area under permanent grass ;

(*b*) How to improve his remaining grass ; and

(*c*) How to establish high class temporary leys.

It will be necessary first to consider methods of improvement which do not involve breaking the existing turf and re-seeding

or altering the rotations. Wherever possible, improvements on these lines should precede the breaking of grass land, for the obvious reason that a good turf will make better rotation land than an outrun one. The means which may be usefully employed are: (1) top dressing, (2) renovating mixtures, (3) altered methods of stocking, (4) substituting pasture for meadow conditions or the reverse, (5) eradication of weeds, and (6) drainage.

(1) **Top Dressings.**—The permanent improvement of pastures by top dressings depends chiefly upon the action of suitable treatments on leguminous herbs. It is fortunate that all types of grass land include some of these herbs in their flora; for although white clover is pre-eminent, bird's-foot trefoil and yellow suckling clover respond almost equally well to slag, and the meadow vetchling to superphosphate. An increased development of these noduliferous plants tends to accumulate fertility in the soil, and this re-acts favourably upon the valuable indigenous grasses. The various legumes are largely dependent on sufficient supplies of phosphates, potassic salts and lime for their maximum development. Lime is of course abundantly present in many of our soils. Kainit or other potassic fertilisers are frequently not necessary on grass land in this country, but it is often expedient to use potash in one form or another on gravelly soils, and applications of this fertiliser are sometimes beneficial on shallow soils even in districts of high rainfall. Potassic fertilisers are essential to good clover development on poor upland pastures in many parts of Merionethshire. They have, however, proved quite useless on many types of upland grazing.

In recent years the most remarkable results have been obtained by liberal dressings of basic slag, and it is now realised that slag is capable of re-acting excellently on many classes of calcareous soil. Superphosphate, however, in some localities gives better results than basic slag, and on some shallow soils in non-calcareous districts superphosphate in conjunction with lime answers rather better than slag. Trials should therefore be conducted in every characteristic district to establish definitely the best means of applying phosphates to the local grass land. The value of lime to grass land has been somewhat overshadowed of late by the results everywhere obtained by basic slag. The writer has, however, been able to report on cases where the addition of lime to slagged areas has been of the greatest importance (16). Lime in many non-calcareous districts is practically essential to

first-rate barley production and should also be largely employed to mitigate the ravages of finger-and-toe in the turnip fields. The lasting effects of lime in such districts, however, are to be seen on the grass land, where it not only has a marked influence on the clovers and valuable bottom grasses, but undoubtedly exerts, in some manner not yet explained, a definite effect on the palatability of the herbage.

As a top dressing lime or limestone in its various forms does not always produce the good results that may be legitimately expected of it ; or at the best its action may be long delayed. The influence of quick lime (ground or lump) is often to detract from the productivity of the herbage for at least eighteen months after its application (25). The best and most certain way to apply lime to grass, therefore, would seem to be to put it on the rotation land before the " seeds " are sown. This aspect of liming is discussed below (p. 20). Lime composts applied to grass land do not have the same retarding influence on the herbage as lime spread alone, and undoubtedly afford an excellent means of putting lime directly on the herbage.* Composts, however, need to be made with great caution. Though road scrapings, so commonly used in many districts, are frequently a means of introducing the locally indigenous white clover and suckling clover, they are just as often responsible for the appearance of silver weed, in gregareous patches, all over a field.

Top dressings are often disappointing when applied to very " foggy " or mossy swards ; if possible the " foggage " should be grazed down before the manures are spread ; an application of salt may help to this end. It is also an advantage to harrow and break the surface as much as possible with either a specially-designed tined implement or with the ordinary toothed harrow.

The time of application of basic slag is not of prime importance on old grass lands ; excellent results are frequently obtained when slag is not spread until March. Slag put on as late as June has also shown to advantage on the herbage by the autumn.† The trials at Cockle Park have proved that slag adds to the autumn and winter grazing better than other dressings, and recent trials at Hafod (Aberystwyth) also show that the herbage on plots treated with slag maintain a pro-

* It must be remembered that road scrapings alone often have an excellent influence on pastures, consequently the good results frequently obtained from the use of lime composts may not always be primarily due to the lime.

† Dr. Somerville states that he applied slag last June with excellent results.

longed grazing season. If basic slag should become available in greater amount during the late spring, or if farmers have stocks over after tilling their arable area, it would probably be better to apply this to grass land in June rather than wait until the autumn, since autumn and winter keep will be of great value under present conditions. In the event of a dry summer, slag put on in June will probably not influence the autumn grazings, but it will re-act as well as later dressings upon the grass during the spring and summer of 1918.

The trials at Cockle Park show that sodium nitrate and ammonium sulphate, used in conjunction with phosphatic manures, retard the development of the clovers and may actually depress the productivity of the herbage; the results of trials in general would seem to show that even if the nitrogenous fertilisers do not always have a negative influence they do not leave a return on the outlay.

The feeding of cake to animals on grass land would similarly appear to have no beneficial influence on the herbage, and is, at the present time at all events, a practise to be condemned.

Farmyard manure in conjunction with basic slag has shown decidedly good results in recent trials in mid-Wales, and has had practically no retarding influence on the clovers compared to the "slag alone" plots. The Cockle Park trials seem also to suggest that good results are to be obtained from the judicious use of this combination.

(2) **Renovating Mixtures.**—A renovating mixture is probably only justified on fields where top dressings are unable to establish a development of leguminous herbs. The seeds to be sown should therefore consist chiefly of appropriate legumes such as wild white clover, bird's-foot trefoil and yellow suckling clover, with a little of such permanent grasses as crested dog's-tail and rough-stalked meadow-grass; perennial rye-grass would be added to act as a "nurse" and offer some protection to the smaller seedlings when stock are first turned in. Renovating should be followed up with liberal dressings of phosphatic manures. On calcareous soils, where the herbage is thin and a certain amount of earth is on the surface, the seeds may establish themselves without harrowing with a tined implement. Failure is often due, however, to the fact that the seedlings are unable to obtain a hold on the ground. It is always necessary in wet districts where the herbage covers all the surface to harrow frequently with a toothed harrow; this is best done when the land is wet. The harrowing should

be continued until the surface is considerably broken, when the seeds will have a moderate chance of obtaining a hold on the ground. Soil obtained from ditches or road sides may be usefully spread over the field to assist the young seedlings—care must be taken, however, that the soil used is not a carrier of weeds.

The seed for a renovating mixture is usually sown early in the spring or in the autumn, and the sowing should probably be done during wet weather.

(3) **Altered Methods of Stocking**.—Prolonged grazing with one class of animal only usually leads to deterioration in the herbage. Sheep exert some beneficial influence on pastures; but the running of sheep alone over large tracts of grass has been both directly and indirectly responsible for much harm. It cannot be too strongly emphasised that grass land left unmanured and practically ungrazed deteriorates much more rapidly than land over-stocked. The tendency for nearly all classes of grass land, if left alone, is to alter in the direction of scrub or other wild condition—an alteration that implies the substitution of the poorer grasses for the more valuable and a non-gramineous for a gramineous herbage. Sheep of a class will pick up "keep" from even poor grass. This fact has led to hedges and fences being allowed to go out of repair and the consequent selective grazing—the hopeless under-stocking of the poorer fields—has led to a rapid deterioration in the herbage. This in turn, since manures are withheld, has led to even greater under-stocking, and therefore a progressive falling off in the quality of the herbage. It is this negligent plan of sheep farming, under which anything from 75 to 100 per cent. of the holding has been, in effect, run merely as a ring-fenced sheep-walk, that is responsible for innumerable acres of derelict land in the country to-day.

The essential point for the grazier to work upon is that proper stocking encourages the valuable indigenous pasture grasses as nothing else will. If the best results are to be obtained from slag and other top dressings it is obvious, therefore, that fences must first be made good. Improved areas can carry more stock than neglected areas, but if the maximum results are to be looked for they must be supplied with the extra head of stock. When animals have access, at will, to improved and unimproved areas alike—an all too common condition under the existing state of fences on many farms—they naturally tend to congregate on the improved

areas to the entire neglect of the unimproved, and the latter in consequence deteriorate rapidly. Under these conditions the aggregate grazing of the farm often becomes less than when improvements were first taken in hand.

What amounts to under-stocking often occurs on good grass land on which beasts are fattened with added feeding-stuffs. These animals have not to browse very closely for their keep; they therefore graze selectively. The result is that cock's-foot, Yorkshire fog and other grasses become coarse and tufted in patches all over the field. Hungry store cattle should follow after the butcher's beasts in order to complete the grazing. Grazing by cattle alone favours the spread of hardheads and ragwort, or by grazing sheep alone the creeping thistle is much encouraged.

Ponies do not usually combine well with other stock, but are very useful if they can be brought in or "tacked" to graze down a rough herbage prior to the application of fertilisers or to breaking the sod.

In conclusion it should be emphasised: (1) that it is impossible to stock a farm adequately unless it is well fenced; (2) clever stocking implies grazing the fields not only with a view to feeding the beasts but also with a view to improving the herbage; (3) sheep alone or "forward" and fattening beasts alone lead to a deterioration in the herbage; (4) the amount of stock which can be carried on a well-fenced, well-manured grass farm is out of all proportion to what the same farm would carry if badly fenced and unmanured; and (5) over-stocking is of course an evil, for not only does it lead to illness amongst the animals, but frequently to excessive consolidation of the ground in wet weather, and complete ruination of the herbage in dry weather. A good turf, however, withstands both drought and consolidation better than a poor one.

(4) **Substituting Pasture for Meadow Conditions, or the Reverse.**—It is often said that permanent fields should be put aside, as either pasture or meadows. This is undoubtedly a sound practice on fertile soils and where the management is good. On poor soils, but slightly manured, it is a practice strongly to be condemned. An indifferent herbage which yields hay year after year becomes full of Yorkshire fog, soft brome and yellow rattle. All these plants set and ripen an abundance of seed early; under meadow conditions they therefore gain progressively on the ground from year to year. Three or

four years' grazing always exerts a beneficial influence on such fields. The fields should be liberally dressed with basic slag, and subsequently with farmyard manure during the period of grazing; the full influence of the manures will then re-act on the herbage, since it will be possible to graze a large head of stock upon the field. It is always advantageous to delay the manuring until the pasture period commences; for when manures are added, and one or two further crops of hay are removed before the field is converted into a pasture, the fertilisers are largely carried away in the haycart. It is better to improve the herbage first and wait until the field is again converted into a meadow before recovering the value of the fertilisers in increased hay yields.

Poor pastures can be improved by taking one or two crops of hay. A poor pasture consists largely of bent which seeds late. If the hay is cut in good time a preponderant amount of seed will fall from such rye-grass, crested dog's-tail and wild clovers as may be present, to the ultimate advantage of the field. Yorkshire fog is not very common on poor pastures, although plentiful on many of the better classes of land; the taking of a hay crop is therefore not likely to favour the spread of this plant.

The field should not be manured for the benefit of the hay unless meadow conditions are to be maintained for a considerable period. Liberal manurial treatment would best follow when the field was again used as a pasture. A change from pasture to meadow conditions continued for a period of years tends to suppress such weeds as thistles and soft *Crepis*, and frequently also reduces moss.

(5) **Eradication of Weeds.**—A few brief notes are appended on the eradication of some of the worst weeds of grass land.

Docks.—These weeds frequently owe their origin in the first instance to being introduced with the red clover. They must be dug up, every bit of the root being removed. Seeding should be prevented.

Thistles.—The spear or boar thistle must be cut with a scythe or mowing-machine in late June or July; or the rosette should be cut with a spud early in the spring. The creeping thistle must be cut above ground early in the year (when the plants are about 6 in. high), and again once or twice as the season advances. Methodical cutting for two or three seasons is the only method by which this thistle can be destroyed.

Wild Carrot.—Like the dock this weed is frequently introduced with red clover seed. It is a very difficult weed to

eradicate. This weed is more plentiful in meadows than pastures and may be decreased by close grazing for two years. It may be cut with a spud, or the aftermath may be cut with the machine or scythe to prevent this late-maturing plant ripening its seed. Fields that are badly infested with this weed should be brought under the rotation.

Hardhead or Knapweed.—This weed requires close grazing with sheep early in the spring.

Mat Herbs.—The mat herbs include ribgrass, cat's ear, daisy and other broad-leaved weeds. Sulphate of ammonia should be applied at the rate of 1½ cwt. to the acre during the summer. Fields treated in this manner should be dressed with basic slag subsequently, in order to bring about a general improvement in the herbage.

Yellow Rattle.—This weed is often very plentiful on old meadows and on leys older than three years which are continuously cut for hay. It may be reduced considerably by grazing such fields for two or three years, or by cutting the hay very early before the seed ripens. Recent trials conducted at Aberystwyth (26), show that agricultural salt applied at the rate of 6–10 cwt. to the acre, when the seedling plants are quite small (middle of April to early May), is competent completely to eradicate this weed. Dusty nitrolim (2 cwt. per acre) applied in dry weather at the end of May completely cleared the weed from plots so treated at the Harper Adams Agricultural College (22).

Bracken.—This weed, as Gordon (9) has shown, reduces grazing by supressing the natural grasses. It is also harmful to sheep, since those with heavy fleeces may be " cast " in the bracken. It spreads chiefly by its underground rhizomes. Bracken should be cut regularly until it is supressed. Trials conducted in North Wales (24) have shown that cutting about the beginning of July for two or, if necessary, three years in succession is an excellent means of eradicating the weed.

Trials in Scotland (9) show that spraying with a 5 per cent. solution of sulphuric acid early in July, and again early in August, is also a successful means of destroying this weed. The spray may injure the grasses unless the canopy of fern is moderately dense.

Gorse.—Dr. Somerville states that burning gorse in July is a very effectual means of destroying it. A certain amount of gorse is useful on exposed sheep walks both as shelter and for winter grazing. There are, however, large tracts of dense gorse in the country which should be destroyed.

Moss.—Superphosphate has a decided depressing influence on moss. Applications of superphosphate have been shown by trials conducted at Aberystwyth (25) to keep the moss in check for quite three years.

(6) **Drainage.**—Extensive pipe or tile drainage is out of the question at the present time. There are, however, large tracts of poor grass land on retentive clays that could be improved comparatively cheaply by mole drainage. The effect of mole draining on such pastures is not only to carry away excessive water but also to aerate the soil, and therefore encourage an earlier and prolonged growth of grass. The importance of mole draining has been urged upon farmers by The Food Production Department, a bulletin (30) on the subject having been recently issued. It is much to be desired that poor pastures on clay soils should be improved by this means, so that a considerable increase in the grazing available from such fields should be obtained during the coming summer, autumn and winter. Should the summer be a wet one, late applications of basic slag would be likely to add further to the amount of keep available and serve also to prolong the grazing season. In view of the shortage of feeding stuffs any measures calculated to prolong the grazing season of our pastures are deserving of earnest consideration.

IMPROVEMENT BY BREAKING THE TURF.

In the eastern and southern counties of low rainfall, and in the more essentially arable counties generally, old grass is likely to be converted into arable land proper, with only one or two-year rotation leys entering into the rotation. In the western counties, and in other cattle-rearing districts, old grass should be converted into arable land with good temporary leys ; that is to say, the object would be not only to produce more crops but also to convert the poor and out-run grass into high-class leys. In both cases, however, the preparation for and selection of the first crop is a matter of prime importance. Wireworm is always a danger to the first crop taken. Potatoes, oats, wheat or rye, mustard, rape or linseed, are crops that are often successfully grown on an old turf. Spence (15) has described a method whereby excellent yields of potatoes may be obtained from grass of moderate quality on soils of good depth. The plan adopted is to set one plough to skim the turf, and this is followed by another which buries the turf to a depth of about 9 in. Useful crops of potatoes are also obtained on shallower, friable soils by ploughing before

Christmas, when winter frosts bring the soil into condition by planting time.

Trials conducted in Devon (4) have shown that good crops of potatoes may be obtained on land at about 800 ft. above sea level, which farmers have regarded as not worth cultivation, by resort to the summer fallow and the use of adequate manures. If the ploughing cannot be completed early on shallow soils, rape or mustard may be sown rather than let the land lie fallow through the summer.

Corn or potatoes would follow. Oats are perhaps more certain than wheat as a first crop on an old turf. Trials conducted at the South Eastern Agricultural College (11) show that the damage from wireworm has not been serious when a sufficiently consolidated seed-bed can be obtained. Falconer (5) has obtained excellent results by ploughing late (during March and early April) ; he claims that late ploughing is better than early—for he maintains that the wireworm feeds on the newly-ploughed turf, at all events until the oat plants are sufficiently established. Falconer also urges the necessity of proper consolidation which he ensures by use of steam tackle and the furrow-press, despite the fact that under his system of ploughing the preparation of the seed-bed and the seeding are continuous operations.

The conversion of poor grass into rotation land with temporary leys, which is here advocated as a means of adding to both the output of crops and the effective grazing in essentially grass-land districts of high rainfall, should be conducted on a well-thought-out plan. The manurial value of white clover and other leguminous herbs must be once more insisted upon, for it is only by turning this fundamental fact to full account that the best results are to be achieved.

It should be first decided how many acres of poor grass can be broken up annually for a period of years. The fields that will have to remain in permanent grass should then be carefully selected and manured generously. The fields destined to come under the plough would be allocated to their respective years. The fields to be taken in hand at the end of the sequence would be improved by the most appropriate of the methods previously discussed ; and all of them except the first to be tackled would receive a dressing of basic slag (or of superphosphate if local experience so suggested) two or three years before their turn came to be broken. By this means extra grazing would be obtained to help tide over

the period of change, and also an improved turf with valuable clover residues would be assured for the benefit of the subsequent arable crops.

Lime would not be applied until each field came under the plough. It would be used whenever convenient in the rotation, remembering that it is not essential for oats or potatoes, but valuable for barley and swedes. The effect of lime, like that of basic slag, will be cumulative; together they make clover formation a practical certainty and therefore make for enhanced fertility—provided, of course, that the subsequent leys are ploughed down before deterioration sets in.

Manures should be freely used in the rotation, and phosphatic fertilisers should be applied to the ley after the first crop of hay has been harvested, or in the second year, to ensure a good mat of white clover when the turf is ploughed down at four years old. The best time to apply slag to a temporary ley is not always an easy matter to decide. On soils which have been liberally treated in the rotation, if slag is applied immediately the corn is harvested, it reacts at once on the red clover which in consequence yields almost too heavily the first year and then dies back. A later application, *e.g.* in the first aftermath, tends to "hold" the red clover on the sward and reacts sufficiently quickly on the white clover.*

The period of change would, of course, require some modifications in the ordinary rotations, especially if it is contemplated to break up much poor grass in any one year. The chief necessity would be to obtain extra grazing, by all means possible, to compensate for the grass taken under the plough before a regular sequence of productive temporary leys was established.

The writer has been conducting trials on these lines for the Agricultural Department at Aberystwyth since the outbreak of the War. The Department has been fortunate in obtaining the hearty co-operation of Mr. Stanley M. Bligh, Cilmery, Builth Wells, who has successfully broken up much poor grass on his estates in Breconshire. Mr. Bligh's aim has, from the beginning, been patriotic. He has set himself to break up as much grass as possible; to obtain the maximum of crops; and, at the same time, to add to the fertility of his land, and to lose as little grazing as possible during the period of change.

* This applies, of course, to leys put down for a period of years when late-flowering red clover would have been included in the mixture.

In Wales, as in Devonshire and elsewhere, it has been customary in the past, when old turf is ploughed down, to leave the fields through a summer fallow before any crop is taken. This procedure is not at all generally necessary. If a tilth cannot be obtained by early spring for oats it is often possible to ensure a seed-bed by June for rape, and, failing this, rye may be put down in August. If the herbage was originally very poor a crop of rape put in in June and subsequently folded on the land makes an excellent preparation for oats or potatoes the following year.

A plan that Mr. Bligh has successfully adopted is to sow a one-year seeds mixture with the oats in the spring on a newly-ploughed turf. This ensures, from one ploughing, both a crop of corn and of hay, also some valuable grazing and clover residues to be turned under. Potatoes would follow. In the case of fields from which it is proposed to take two crops of corn in succession it is a good plan to sow a certain amount of Italian rye-grass and red clover.* This will afford some useful autumnal grazing and will make for enhanced fertility, since the residues will be ploughed down about Christmas. When rye has been drilled in August, rye-grasses and clovers may be sown on the braird in the spring, after the rye has been grazed lightly over with sheep. If the rye is harvested the rye-grass and clovers will afford a subsequent bite; or a full sowing may have been put in, when the field will run on for a year or two's pasture.

It is often possible to plough more land in winter than can be dealt with during harvest time. Trials have been conducted in Cardiganshire and Montgomeryshire, and by Mr. Bligh in Breconshire, with a view to putting such land immediately down to grass. The plan adopted has been to establish "rape pastures" on the lines successfully carried out by Wibberley in Ireland. The field is ploughed about Christmas time; lime is subsequently harrowed in and a preliminary tilth is obtained in April or May, when the seedlings of annual weeds are harrowed out. The final tilth is obtained toward the middle or end of June when a full seeds mixture for a four-year ley is sown, together with a nurse of not more than 3 lb. of rape (on the better classes of soil 1½ to 2 lb. of the "nurse" is quite sufficient) to the acre, or a corresponding quantity of rape and turnips mixed.

Basic slag (6 to 8 cwt. per acre) is applied with the last harrowing when the seeds are sown. The grasses and clovers

* See page 27.

grow very quickly when sown late and in this manner. A good bite of grass, clovers and rape is obtained in the autumn and must be carefully grazed down, as it is essential on the one hand that the young plants are not eaten to the " heart," and on the other that the clovers and grasses are not allowed to become " winter proud."

The principle of the rape pasture can be extended and applied to difficult land which is unsuitable for even long rotation purposes. Many fields from which it is impossible to harvest crops can, however, be ploughed on the " one-way " system. The bagged limes can, moreover, be applied on land where burnt lime would be out of the question. Mountain and hill land, therefore, where the soil is not too stony or shallow, may frequently be converted into improved pasture land by resort to this method. Where bracken is very dense it would be well first partially to destroy it by cutting or other means ; or by taking a crop of rape alone and following the next year with the rape pasture. Bracken will, however, even if partially destroyed, be sure to reappear to some extent after but one or even two ploughings. It should be hand-pulled as it comes up during the first autumn and spring—work which can be well performed by a gang of women. If subsequently the field (and it will be an improved herbage) is grazed with cattle as well as sheep the bracken will not become serious for a number of years.

One ploughing will not usually prove sufficient to eradicate gorse, for even if the roots are hand-dug the seedlings will reappear. Gorse land, however, whenever the field is all workable, should always go through the rotation. Such land is usually moderately fertile and capable of producing excellent crops of oats. Farmyard manure and lime applied during the arable period, followed up by adequate grazing on the improved ley or pasture, that will end off the rotation, will ensure freedom from gorse for a number of years.

The fact that good swards can be obtained both in corn and under rape on a freshly-ploughed turf is of considerable importance. Breaking up poor grass, therefore, is not only to be regarded as a means of introducing a new and extended system of rotation husbandry, but may also be employed with a view to establishing improved permanent grass. This method would seem, moreover, to have some very decided advantages over top dressings, renovating mixtures, and so on. For instance : (1) lime and basic slag can be incorporated with the soil, lime under these conditions exerting no

retarding influence; (2) the field is cleared of weeds, and moss destroyed; (3) the soil is completely aerated; and (4) wild white clover and other essential plants are given a certain hold on the ground from seeding. It is, of course, a method only to be adopted on friable soils of such a nature that a reasonable tilth can be assured; when these conditions are fulfilled more certain results are to be looked for than from surface treatments.

When poor grass is broken up with a view to extending the area under the plough, and establishing a sequence of high-class temporary leys, it is of the utmost importance that the rotation should not take too much from the land; consequently, manures should be applied in proportion as crops are wholly removed. Fertility may, and should, be husbanded by ploughing in plant residues; hence the suggestion already made of sowing rye-grass and clovers with all corn. It may be thought that this plan, and also that of putting down a one-year mixture, would tend to clover sickness in the subsequent and all-important temporary ley. This is not, however, a risk that need be seriously considered in the case of land which has not been broken for decades, and which has probably not produced a plant of red clover for a generation or more. If there are good reasons for fearing clover sickness, then the plan largely adopted in parts of Merionethshire may be given a trial. This consists in sowing turnip seed on the oat braird in the spring, so affording a measure of autumn keep and plant residues for the plough.

It may be added that rape and turnips mixed make an ideal "nurse" for "seeds" when put down at the end of a rotation which has yielded several crops of corn. This is a common practice amongst some farmers on Exmoor and on the Welsh hills, where it gives uniformly good results. It is, however, a practice which is very localised, but should be much extended. There are two distinct advantages to be gained by the use of rape and turnips as a "nurse" over corn: (*a*) the final crop is returned to the land for the benefit of the "seeds"; and (*b*) "seeds" with rape need not be sown until June. This gives a prolonged opportunity for cleaning the land; on poor, non-calcareous soils young "seeds" are often completely smothered by such weeds as spurrey and sheep's sorrel.

It should be pointed out that the maximum life of a ley compatible with productivity varies considerably from field to field and from locality to locality. The usual practice

where the long rotation is in vogue is, however, to leave the sward down just as long as it will yield any sort of bite. That is to say, it is ploughed down at just the wrong time—when it is completely run out, and when clover residues, and residues from the turf generally, are at their minimum value.

It is realised in many localities that fields do not sward well, and an endeavour is therefore made to take the rotation gradually round practically the whole farm. This practice, however, is not correlated with the use of efficient seeds mixtures and frequently entails leaving the leys down from six to twelve years; and selection in the wrong direction is exercised, the outrun leys falling to the plough. The experience of the writer in many localities, which are only capable of producing poor grass, suggests the four-year ley as being of good average duration upon which to base a working plan.

The amount of permanent grass arranged for must therefore to some extent turn upon the size of the farm; the plough can, however, be accelerated in its journey round the leys if one or two fields are ploughed each year and put straight down to rape pastures or sown with corn and a seeds mixture. It is not, moreover, necessary or desirable that the poorest fields should be made to yield at least two straw crops and roots every time they come under the plough. It is perhaps remarkable that on inaccessible fields grass rotations have never been practised. A grass rotation would consist of putting a field down with rape as a "nurse," ploughing and re-seeding under rape before the first signs of deterioration set in, and repeating this operation on every occasion when the sward ceased to "hold." It would be found that under the influence of accumulated fertility (no crops being removed), the sward would "hold" for longer periods under each successive ploughing, basic slag being regularly used, and lime at suitable intervals. This suggestion has been taken up by a farmer in Cardiganshire, and the second "sward" has now been successfully established.

There is one very important practical point in connection with the more intensive methods of managing grass land here advocated. A very large proportion of the ploughing, both in the first instance and when the new leys came to be broken, could be undertaken in bad and wet weather, and in almost every month of the year. Rape pastures can be prepared for at odd times when the teams would otherwise be idle; and it is often an advantage to break up old turf during wet periods.

Crops, moreover, would not have to be harvested on the land which had been ploughed. There is no doubt, therefore, that an enterprising farmer, even with the teams and tackle at his disposal under his present extensive system, could start on the more intensive plan with very little risk or inconvenience. He would, by so doing, not only add to the nation's cereal supplies but very soon find that he could keep a considerably increased head of stock on his farm.

The general principles outlined are, of course, applicable in districts where the four-course rotation is the practice. In such districts the rotation is usually confined to a certain part of the farm, the rest being permanent grass proper. Porter (14) has advocated the methodical breaking up of this permanent grass. He would take the rotation over a larger proportion of the farm, and would substitute the three-to-four-year ley for the one-year "seeds" in compensation for the permanent grass broken up.

In districts where a four-year ley is to be adopted instead of a longer one, the risk of damage by wireworm is, of course, less than formerly; where, however, the longer ley is substituted for the shorter this risk would possibly be aggravated. From the enhanced fertility point of view, however, Porter's plan would seem to have everything to recommend it, and could certainly be adopted to great advantage on many farms.

There are some poor grass fields which should be farmed on the four-course rotation. Such fields are those at present carrying a certain amount of rushes; but which at the same time are not in great need of drainage. If such fields were ploughed and put down to grass after but one rotation the rushes would completely dominate the field, becoming far more plentiful than formerly; whereas, if kept under the four-course rotation for a number of years, the rushes would gradually be extirpated.

The principles laid down in this section are deserving of the earnest consideration of the War Agricultural Committees or of landowners and farmers who have the use of motor tractors. It is deplored on all sides that the ploughing season automatically ceases in March or early April. Poor and especially outrun grass can, however, be broken practically all the year round; and, as already stated, if ploughed before June rape or rape pastures can be sown, if before August rye, and if later than August oats the following spring. Committees contemplating taking this action should, however, arrange that clover and rye-grasses are sown with a fair proportion of the

oats forthwith. The methods of improvement discussed in this section have assumed that in every case reliable seeds mixtures will be employed. It will be necessary, therefore, to consider briefly the question of selecting an adequate mixture and the purchase of genuine seed.

SEED MIXTURES.

Sward formation takes place under the combined influence of the species sown and of those that spring up naturally (18). A rotation ley is entirely dependent, for valuable species, on the plants that are sown, for only arable-land weeds and such worthless grasses as Yorkshire fog and soft brome will make an indigenous appearance during the short period such leys are left down. A temporary ley should, if the management has been good, derive some support from valuable indigenous species. A permanent pasture will in its adult stage, at all events, be almost wholly dependent on indigenous species. When selecting seed for temporary leys and permanent grass, therefore, local knowledge is of prime importance, not only because the influence of indigenous species is profound in proportion to the length of time fields are left down, but because a great number of the so-called "natural" or "permanent" grasses and clovers of commerce do not function, in many localities, as either natural or permanent plants. It is not surprising that this should be the case when it is realised that nearly all the "permanent" seeds supplied by seedsmen are imported into this country from overseas.

Speaking quite generally, the real value of the commercial permanent grasses and clover seeds is not for the purpose of establishing an adult turf of these plants; rather are they valuable because by their judicious use it is possible to tide over that difficult period in the life of every prepared field between the failure of the rye-grasses and clovers and the establishment of an indigenous sward. Paradoxical as it may appear, therefore, the "natural" grasses are just as and often more valuable for the formation of temporary leys than for permanent grass. A field put down for 20 years and upwards can be carefully nursed for a few early years without seriously affecting its aggregate productivity; a temporary ley on the other hand must, if it is to justify itself, yield uniformly well during its whole short life. The above facts cannot be too strongly insisted upon, for in many localities temporary leys of three years and upwards are put down without the inclusion of any plants except rye-grasses and clovers. It has, further-

more, usually been just such leys that have been allowed to run on, so that the insufficient seeding of temporary leys has in the past been largely responsible for the present acreage of outrun grass in the country. It has not only been a misguided sense of economy that has contributed to this under-seeding, but many farmers have learned to regard even cocksfoot and timothy as being "natural" or "permanent" grasses and therefore not suitable for inclusion in temporary mixtures. The seedsmen are themselves largely responsible for this state of affairs, for all the species other than the rye-grasses are frequently listed as "natural" or "permanent." There are, moreover, covenants in leases to-day which stipulate for the sowing of a bushel of rye-grass.

In drawing up seed mixtures it is, in reality, only necessary to differentiate between (*a*) one-year leys, (*b*) two- or three-year leys, and (*c*) leys for over three years, including permanent grass, remembering that the essence of farming grass on the temporary ley basis is to plough down a good turf.

It does not follow, however, that the mixtures necessary under the last of these categories should be very complicated. The essence of a good mixture is the inclusion, in sufficient amount, of species that will be certain to succeed, and the rigid exclusion of all others. A species has not succeeded if several pounds of expensive seed only contribute a few plants scattered over a field. In the interests of sound grass management and economy there is nearly as much need for the simplification and cheapening of elaborate mixtures as for reinforcing the old-fashioned rye-grass sowings. Some cheapening is the more desirable since it is often advisable, if not absolutely necessary, to include wild white clover in a mixture.

It may be helpful to give a few short notes on the commoner grasses and clovers supplied by seedsmen, in order that farmers may be in a better position to decide for themselves not only which species to include but also which to exclude from their mixtures.

The Grasses.—*Italian Rye-grass.*—At Cockle Park (21) perennial rye-grass is a heavier yielder than Italian, and Findlay (23) finds that neither a large nor small amount of Italian rye-grass included in mixtures for three-year leys adds to the hay crop. Evidence suggests, however, that on some soils this grass does add to the hay yield in the first year, but if included in mixtures 2–4 lb. per acre would be ample.

Perennial Rye-grass.—This is a very valuable grass, yields well in the first year's hay on practically all soils, and

can be cut later than other grasses. On many poor soils it does not persist after the second or third year in any quantity. On good land it will make an indigenous appearance but should always be sown—a small seeding (about 8–12 lb.) will, however, produce as much hay as a large sowing.

Meadow Fescue.—This grass is abundant on many of the best grazing fields in the country. It is, however, not a success in seeds mixtures except on some good soils, and is undoubtedly a grass that could frequently be discarded without in any way detracting from the resulting herbage. Findlay (23) finds that it is unable to compete against rye-grass the first year or against cocksfoot and timothy the second year.

The Fine-leaved Fescues.—These include the "sheep's fescue," "hard fescue," and "red fescue" of commerce. The indigenous fine-leaved fescues (especially red fescue) are valuable bottom grasses. In all districts studied by the writer, however, no benefits have ever been observed from including the commercial seed of these fescues in mixtures. Under proper management the locally indigenous species will come into the herbage after about three or four years.

Tall Fescue.—This certainly succeeds better on poor soils than meadow fescue, but does not offer many advantages not also possessed by cocksfoot.

Meadow Foxtail.—Where meadow foxtail succeeds it is a most valuable grass. It is indigenous to good soils, but seldom justifies itself from seeding except on highly fertile fields or fields liberally dressed with farmyard manure for a period of years.

Golden Oat-grass.—This grass persists very well from sowing on many classes of soils. It yields heavily in the hay crop, especially in the third or fourth year, and produces abundant growth in September. It competes well against cocksfoot, which it tends to prevent from becoming coarse and tufted. The seed is very expensive, and consequently it should not be included in mixtures before the grass has been tested on a small scale in the locality.

Crested Dog's-tail.—This is a very valuable grass for poor soils, upon which it contributes in appreciable amount to the hay. It comes in naturally at about the fourth year, but its appearance is hastened by sowing the commercial seed. It should be kept well grazed in order to prevent the formation of the wiry flower stems. It competes well against bent.

Tall Oat-grass.—This grass often makes an indigenous appearance on a newly-broken turf, and on some classes of permanent

grass. On many soils it is a bitter grass not relished by stock. In most cases it should only be included in mixtures if hay is to be taken every year for the duration of the ley, when it will add to the hay crop considerably in the first and succeeding years.

Sweet Vernal Grass.—This is a valuable early grass on poor soils, upon which it usually makes an early indigenous appearance. It is probably not worth sowing, however, since success from the expensive seed is very uncertain.

The Meadow Grasses.—Both of these are capable of a rapid and abundant indigenous appearance on soils that respectively suit them. Rough-stalked meadow-grass, although primarily a grass of fertile land, succeeds well on poor soils in districts of high rainfall, where it competes satisfactorily against bent, and, since the commercial seed makes its entry more certain, is usually worth including in mixtures. It is doubtful if smooth-stalked meadow-grass is ever worth sowing, even on poor soils, since crested dog's-tail is usually more certain.

Timothy.—This is an indigenous grass on some wet situations and fertile soils. A smaller bulbous form is natural to the Cotswolds and other calcareous districts. The commercial seed ensures a good development of this grass by the second year and for a few subsequent years. It should be included in all seeds mixtures in rainy districts where it succeeds even on thin soils.

Cocksfoot.—Under proper management cocksfoot is perhaps the most valuable grass for temporary leys on poor soils. It is particularly useful in districts where perennial rye-grass falls off after the first year, since it attains maximum development in the second or third year, and remains productive for four or five seasons. It does not come in naturally in many districts, and in districts where it makes an indigenous appearance is far more plentiful under meadow than pasture conditions. When used as a pasture grass it must be sown in large amount and be kept well grazed; it should never be allowed to ripen its seed. It is particularly valuable on sheep farms, being one of the earliest grasses to afford keep in the spring; it also picks up rapidly on the aftermath.

The Clovers.—*Red Clover.*—Red clover is put on the market either as "broad red clover," "cow-grass," "perennial red clover," "single-cut cow-grass," or "late-flowering red clover." There is no real distinction between many of the "cow-grasses" and "broad red clover." "Late-flowering red clover," however, appears to be a definite variety. It is a taller and more

bulky plant than broad red, it flowers and matures later, and it does not produce quite as much aftermath. The available evidence suggests that late-flowering red clover "holds" on the ground longer than other varieties; the writer has found that it often yields well in a second year's hay crop and frequently contributes appreciably to the herbage in the third year.

Red clover seed is not only home grown but is imported into this country largely from Chile, France (Brittany), Canada, Russia, and other countries. Trials have been conducted at Leeds (19) as to the value for one-year leys of red clover obtained from different sources. It was found that the largest bulk of hay was obtained from English single-cut cow-grass, Canadian, United States and Russian samples. The clovers which gave the best autumn stubble grazing after the corn crop had been removed were Chilian, New Zealand and English cow-grass. The greatest weight of aftermath was obtained from Chilian, English, New Zealand and Canadian.

Very few trials have been conducted to establish which clovers are the best for the formation of longer leys. Trials at Aberystwyth, however, suggest that the home-grown stocks certainly "hold" on the ground longer than foreign clovers; of the foreign stocks those from Brittany appear to "hold" better than others. More recent trials at Aberystwyth show that Chilian clover produces the best stubble grazing, thus confirming the Leeds results, but at high elevations it does not stand the winter well and is certainly not a lasting plant. The writer's general experience has been that when clovers make excessive growth the first autumn, and run into flower and become "winter proud," they do not yield heavy crops of hay or "hold" on the ground; and there is little doubt that Chilian clover does produce more autumn growth than other clovers. In mid-Wales the best results have certainly been obtained with Welsh-grown clovers, and there seems little doubt that a home-grown sample of late-flowering red clover should form the bulk of the red clover used in mixtures for leys of two to four years' duration. Chilian clover is admirably suited for sowing with corn crops to give an autumn bite before the stubble is ploughed down, but should probably not be used even for that purpose at elevations above about 600 ft.

Alsike Clover.—In districts where wet and cold winters are the rule alsike is frequently more hardy and lasting even than late-flowering red clover. It succeeds well on peat; its inclusion in all mixtures safeguards a "stand" of clover.

White Clover.—The ordinary commercial seed of white or Dutch clover is now generally realised not to give a lasting plant of white clover. The most that can be expected from its inclusion in mixtures is an early appearance of white clover, thus perhaps making good the interval before the local wild white clover comes in indigenously. In many districts white clover is a strongly indigenous plant which on fields liberally treated with slag and lime at regular intervals may make a comparatively early natural appearance ; and it will sometimes contribute as much as 20 per cent. to the herbage (although no white clover has been included in the mixture) by the fourth year. In other districts white clover is not a strongly indigenous plant and will not contribute appreciably to the herbage, despite applications of phosphatic manures, till after the lapse of a number of years. It is on such fields that wild white clover should always be included in the mixture.

The rapidity with which wild white clover establishes itself from seeding on a prepared ley adequately manured, in comparison with the commercial white Dutch and the unsown locally indigenous plant, is admirably exemplified in the table hereunder.

TABLE I.

Showing the number of plants of White Clover per acre on 20th November, 1916, on two fields sown in plots in the spring of 1915. One hay crop had been taken, and the estimates were consequently made on the first aftermath.

A.—Field of 600 ft. Elevation.

Plot 1.	1 lb. Commercial White Dutch included in mixture gave ..	75,000 plants per acre.
,, 2.	½ ,, Wild White included in mixture gave	94,000 ,, ,,
,, 3.	2 ,, Wild White included in mixture gave	106,000 ,, ,,
,, 4.	No White Clover included in mixture gave	31,000 ,, ,,

B.—Field of 800 ft. Elevation.

Plot 1.	¾ lb. Commercial White Dutch included in mixture gave ..	41,000 plants per acre.
,, 2.	2 ,, Commercial White Dutch included in mixture gave ..	87,000 ,, ,,
,, 3.	¾ ,, Wild White included in mixture gave	158,000 ,, ,,
,, 4.	No White Clover included in mixture gave	37,000 ,, ,,

Both fields had received a liberal dressing of phosphatic manures with the corn in which the " seeds " were sown.

Jenkin (12) has furthermore shown that 30 months after sowing 2 lb. per acre of wild white clover, nine times more ground was covered with white clover than upon plots where the ordinary commercial seed had been used. The value of wild white clover may now be taken as an accepted fact (7, 8, 13 & 14), and it is much to be hoped that larger harvests of this important seed will be secured in future. The Food Production Department have issued a bulletin (31) giving particulars as to the best means of harvesting the seed, and there is no reason why more farmers should not secure their own supplies of the seed. The demand for wild white clover probably will, and certainly should, become greater as more poor grass land is ploughed and the value of the good temporary ley is better appreciated.

Yellow Suckling Clover.—This clover is an indigenous plant which on some poor soils contributes (unsown) substantially to the herbage by the fourth year. If reliable seed is used (free from excess of "hard" seed), inclusion in the mixture hastens its appearance.

Kidney Vetch.—The kidney vetch is a variable plant which justifies its inclusion in some localities, but should be subjected to local trials before being largely used.

Bird's-foot Trefoil.—The writer, Middleton, and others have commented upon the manner in which this plant responds to basic slag. It is valuable on poor soils, and, consequently, seed of the wild variety should be given a trial in mixtures. Seed of the wild plant is a common impurity in genuine wild white clover; it is recovered by at least one seed firm and put on the market as such.

Miscellaneous Plants.—*Chicory.*—Chicory has proved itself to be the most generally successful of all the plants other than grasses or clovers for herbage purposes. It yields heavily in the hay crop and affords early and late keep for sheep.

Types of Seed Mixtures.—It may now be assumed that the farmer has decided which species to exclude from his mixture. He must next ascertain how he stands as to white clover and other leguminous herbs. The essential thing is to have a turf of leguminous herbs to plough down at the end of the ley. If a sufficiency of white clover or of yellow suckling clover or bird's-foot trefoil from the locally indigenous (unsown) plants can be relied upon at the end of four years, it is not absolutely necessary that the wild white clover should be included in the mixture. If, however, this is not assured, wild white clover should at all costs be included, and in any

event a small amount added to the mixture tends to accelerate sward formation and prevent the entry of weeds. The inclusion of wild white clover necessitates a considerable outlay, and consequently the mixture must be cut down to the minimum in other directions. The type of mixture successfully employed by Gilchrist (7) for a three-year ley has been (in lb. per acre) :—

16 lb. Perennial Rye-grass.
10 ,, New Zealand Cocksfoot.
4 ,, Timothy.
4 ,, Single-cut Cowgrass.
1½-4 ,, Wild White Clover.

The wild white clover was of course assisted by basic slag, 10 cwt. (39. per cent. phosphates) being applied in the early winter after the nurse (barley) was harvested. This mixture on the heavy soils at Cockle Park gave, on the average, over 2 tons of hay per acre in each of the three years. It will be noted that none of the commercial bottom grasses were included in the mixture. Investigations on grass land in Wales have, however, shown that a good plant of white clover actually hastens the appearance of such valuable grasses as the indigenous red fescue and the meadow grasses. Trials conducted by the writer in Wales also suggest that on soils where white clover makes a partial natural (unsown) appearance, ¾ lb. wild white clover included in the mixture, amply assisted by basic slag, is sufficient to ensure an abundance of white clover to plough down at the end of four years.

After extensive trials in Scotland, Findlay (23) recommends the following type of mixtures for one year's hay and two years' pasture; it is assumed that seeds of good quality are used.

	Per acre.			
	a.	*b.*	*c.*	*d.*
Perennial Rye-grass ..	½ bush.	½ bush.	½ bush.	10 lb.
Cocksfoot	6–7 lb.	8–12 lb.	7–8 lb.	5–6 ,,
Timothy	3–4 ,,	3–1* ,,	4–5 ,,	6–7 ,,
Crested Dog's-tail	—	1* ,,	—	—
Rough-stalked Meadow-grass	—	—	1 ,,	1 ,,
Late-flowering Red Clover	1½ ,,	2 ,,	1 ,,	2 ,,
Broad-leaved English Red Clover	2 ,,	2 ,,	2 ,,	—
Alsike Clover	1 ,,	—	1 ,,	1 ,,
Kidney Vetch	—	1–2* ,,	—	—
Wild White Clover ..	¾ ,,	¾ ,,	¾ ,,	1 ,,

(*a*) For ordinary medium soils in the N.E. of Scotland.
(*b*) For light, dry soils. (*c*) For heavy soils.
(*d*) For peaty soils. * *For the lightest soils.*

The type of mixtures now advocated by the writer, for 3–5-year leys, and successfully employed in mid-Wales, are as follows :—

	Per acre.	
	1.	2.
Perennial Rye-grass	10–14 lb. ..	—
Cocksfoot	6–10 ,, ..	10–16 lb.
Timothy	2–3 ,, ..	4 ,,
Crested Dog's-tail	1 ,, ..	1 ,,
Broad Red Clover	1–2 ,, ..	1–2 ,,
Late-flowering Red Clover	3–4 ,, ..	4–5 ,,
Alsike Clover	2 ,, ..	2–3 ,,
Wild White Clover (according to local conditions)	0–¾–2 ,, ..	0–¾–2 ,,
Chicory	2–3 ,, ..	3–4 ,,

The broad red clover is included chiefly for the benefit of the sheep during the first autumn and winter after the corn has been harvested; maximum sowings of perennial rye-grass are included for the same purpose; and it is sometimes found advisable to include 2 lb. of Italian rye-grass for the same reason. In future experimental trials a small amount of rape (1½ lb.) will be also added. Since farmers in sheep districts are so often driven by necessity to graze their young seeds, the mixtures devised have as far as possible to safeguard the important plants against this bad practice. The only other plants at all generally advocated by the writer for the province in which he is adviser are yellow suckling clover* (2 lb., in cases where the farmer cannot be induced to try wild white clover), and rough-stalked meadow-grass.

The second (cocksfoot) mixture has proved very successful in experimental trials and with the few farmers who have adopted its use. On one farm 14 lb. of cocksfoot was sown with timothy alone and a generous allowance of late-flowering red clover, gave an excellent yield of hay in both the first and second years, and looks very promising for the third (coming) season. The value of cocksfoot mixtures lies in the fact that when sown without competition with rye-grasses the cocksfoot itself and the late-flowering red clover bulk excellently in the first year's hay.

It is important that farmers should realise that equally large crops of hay can be harvested in the first year from mixtures in which the rye-grasses are far short of the antiquated bushel to the acre, or even when these grasses are

* The seed of yellow suckling clover must be purchased with care, since it often contains over 30 per cent. of "hard" seed.

totally excluded. The produce from such mixtures in the second and subsequent years is, furthermore, on many classes of poor soil out of all comparison to the rye-grass clover seedings.

Table II. below, showing the weight of hay harvested per acre in the first year from four plots sown with the mixtures indicated, is given in support of the above statement.

TABLE II.

Showing the type of mixture used in lb. per acre and the weight of hay harvested in cwt. per acre from the 1st crop on four plots at Waun Fawr, Cardiganshire.

LARGE SOWING OF RYE-GRASSES.	SMALL SOWING OF RYE-GRASSES.	ITALIAN RYE-GRASS ONLY.	WITHOUT RYE-GRASSES.
Plot 1.	*Plot* 2.	*Plot* 3.	*Plot* 4.
lb.	*lb.*	*lb.*	*lb.*
Rye-grasses .. 18	Rye-grasses .. 9	Italian Rye-grass only 2	Cocksfoot .. 12
Cocksfoot .. 2	Cocksfoot .. 6	Cocksfoot .. 10	Timothy 1
Timothy 1	Timothy 3	Timothy 2	Tall Oat 4
Hard Fescue .. 1	Meadow Fescue 4	Tall Oat 2	Tall Fescue .. 6
Broad Red Clover 3	Rough-stalked Meadow-grass 2	Tall Fescue .. 4	Sheep's Fescue .. 1
Alsike Clover .. 1	Late-flowering Red Clover .. 3	Crested Dog's-tail 2	Rough-stalked Meadow-grass .. 1
Dutch Clover .. 1	Alsike Clover .. 4	Late-flowering Red Clover .. 3	Smooth-stalked Meadow-grass 1
Trefoil 1	Wild White Clover ½	Alsike Clover .. 2	Crested Dog's-tail 2
	Trefoil 2	Wild White Clover 2	Late-flowering Red Clover .. 4
	Chicory 2	Yellow Suckling Clover .. 3	Alsike Clover .. 2
		Yarrow ½	Yellow Suckling Clover 1
			Trefoil 1
			Chicory 4
			Yarrow ½
WEIGHT OF HAY PER ACRE.			
40·2 cwt.	41·2 cwt.	60·4 cwt.	56·0 cwt.

It should be noted that neither the hard fescue, sheep's fescue, meadow fescue, tall fescue, trefoil, yellow suckling clover, white clover, or smooth-stalked meadow-grass contributed appreciably to the hay on any of the plots. The mixtures were designed solely for experimental and comparative purposes, and should not be followed by farmers. Equally good results were obtained from the simplified mixture advocated for practical men. It must be explained that the yields of hay obtained in mid-Wales last season (1916) were exceptionally high. It is, however, a comparison of the produce from the several plots that is instructive. Trials conducted by Hendrick and Findlay (10) on The Feeding Value of Pastures in Scotland have shown that for grazing purposes heavy seedings of rye-grass are not superior to lighter seedings or to a mixture without rye-grass. The yields of hay have,

however, been slightly heavier when rye-grass in reasonable amount has been included in the mixtures.

THE PURCHASE OF SEED.

This question has been fully dealt with by the writer in an article in the Board's *Journal* (17). It is here only necessary again to emphasise two commonly neglected facts. Gilchrist has shown that New Zealand cocksfoot is the most suitable for temporary leys in northern England, "as it produces more leafy herbage and is about ten days later in maturity than cocksfoot from other sources." This is an exceedingly important point, for its later maturity fits in exactly with the late maturity of late-flowering red clover. It is also essential for the future success of the ley that cocksfoot should be cut before it becomes over-ripe.

From what has previously been said as to the fine-leaved fescues, in addition to the success of New Zealand cocksfoot and home-grown red clovers, it is apparent that the country of origin of the seeds of herbage plants is a question that should be made the subject of carefully conducted trials all over the country.

Temporary leys are frequently ruined at their inception by the introduction of noxious weeds with the seed mixtures. This is a form of negligence all too common even amongst farmers whose management is otherwise excellent—that is, by farmers who will be certain to have obtained a clean seed-bed on land in good heart and who may be depended upon not to stint the essential fertilisers.

The chief sources of noxious weeds are the rye-grasses, since a bushel of uncleaned seed will frequently introduce enough Yorkshire fog and soft brome to make an unproductive ley a certainty. This in itself is a strong argument in favour of reducing the use of rye-grasses. The red clovers, usually sown in large amounts, are also responsible for the fouling of innumerable leys, since they are commonly carriers of wild carrot and dock, as well as of the destructive dodder. In times of peace there is no justification for sowing foul seed; in time of war it is one of the numerous ways open to unthinking civilians of helping the enemy.

SUMMARY OF CONCLUSIONS.

(1) An endeavour has been made in this paper to show that a broad view should be taken as to the position of our grass lands in relation to production.

(2) The intimate connection that exists between well-managed grass land and fertile arable land has been insisted upon.

(3) Basic slag and lime have been shown to exert a profound influence in the spread of white clover and other leguminous plants. The beneficial effect derived from the use of these substances, together with the sowing of wild white clover (when necessary), is cumulative, and under proper management reacts on the fertility of the whole farm.

(4) The extended use of basic slag, lime and wild white clover is therefore fundamental to the successful initiation of plans designed to stimulate production by the adoption of progressive and more intensive methods of agriculture in backward pastoral districts of low average fertility.

(5) The improvement of grass land may often be better achieved by the adoption of altered methods of farming than by resort to top dressings and other surface treatments only.

(6) Well conceived plans to extend the acreage under crops in grass districts of high average rainfall should not seek to add only to the arable area, but should also be directed to a regular sequence of highly-productive temporary leys. Indiscriminate extension of the arable area in such districts can only, as in the past, make for subsequent infertility.

(7) It has been shown that it is possible to do much of the ploughing necessary to convert poor grass into rotation land with productive leys, with the additional object of improving permanent grass as such, both during the late spring and summer and in adverse weather during winter.

There is, in consequence, in many districts considerable scope for the employment of motor tractors over a greatly extended period of the year, apart from the preparation of land for the sowing of autumn wheat.

(8) The selection of suitable mixtures is of the utmost importance in connection with farming on the temporary ley basis. At one end of the scale it is necessary that the rye-grass clover mixtures should be reinforced, and at the other end there is considerable scope for simplification in the complicated mixtures often employed.

NOTE.—The writer of this article, while taking full responsibility for the views expressed, and for the accuracy of the facts stated, desires to thank his colleagues in the Technical Section of The Food Production Department of the Board for many valuable suggestions and much useful information.

REFERENCES.

1. AMOS, ARTHUR.—Converting Pasture to Arable Cultivation : *Jour. Board Agric.*, Vol. xxii, No. 11, Feb., 1917.
2. ARMSTRONG, S. F.—The Botanical and Chemical Composition of Pastures and Meadows : *Jour. Agric. Science*, Vol. ii, Part 3, Dec., 1907.
3. CARRUTHERS, WM.—The Composition of some of the Famous Pastures of England : *Jour. Roy. Agric. Soc. Eng.*, Ser. 3, Vol. i, 1890.
4. DUTTON, F. V.—The Utilisation of Waste Land : *Jour Board Agric.*, Vol. xxiii, No. 7, Oct., 1916.
5. FALCONER, JAS.—The Ploughing up of Grass Land and its Subsequent Treatment : *Jour. of the Farmers' Club*, March, 1917.
6. FREAM, W.—The Herbage of Old Grass Lands : *Jour. Roy. Agric. Soc. Eng.*, Ser. 2, Vol. xxiv, 1888.
7. GILCHRIST, PROF. D. A.—Wild White Clover : *The Farmer and Stock-breeder Year Book*, 1917.
8. ——————Trials of White Clover : *Jour. Board of Agric.*, Vol. xxii, No. 11, Feb., 1916.
9. GORDON, G. P.—Bracken (*Pteris Aquilina*), Life History and Eradication : *Trans. High. and Agric. Soc. of Scot.*, 5th Series, Vol. xxviii.
10. HENDRICK, PROF. J., and FINDLAY, WM. M.—The Feeding Value of Pastures : *Trans. High. and Agric. Soc. of Scot.*, 5th Series, Vol. xxvi.
11. HUTCHINSON, C.—An Experiment in Breaking up and Cropping Old Grass Land : *Jour. Board of Agric.*, Vol. xxiii, No. 12, March, 1917.
12. JENKIN, T. J.—Ordinary White Clover Seed *versus* Wild White Clover Seed : *Jour. Board Agric.*, Vol. xxiii, No. 12, March, 1917.
13. M'ALPIN, PROF. A. N.—Wild White Clover : *Trans. High. and Agric. Soc. of Scot.*, 5th Series, Vol. xxvii.
14. PORTER, JOHN.—A Big Stride in Agricultural Improvement ; *The Hereford Times.*
15. SPENCE, MAJOR D. A.—Potatoes : *Jour. of the Farmers' Club*, Jan., 1917.
16. STAPLEDON, R. G.—Rape Pastures : *The Jour. Univ. Coll. of Wales*, Vol. viii, 1915.
17. ——————Report on Seeds Purchased in Central and S. Wales, Seasons 1915–17 : *Jour. Board Agric.*, Vol. xxiii, No. 9, Dec., 1916.
18. —————— and JENKIN, T. J.—Pasture Problems : Indigenous Plants in Relation to Habitat and Sown Species : *Jour. Agric. Science*, Vol. viii, Part 1, Sept., 1916.
19. UNIVERSITY OF LEEDS, Bul. No. 57 : Report on Nationalities and Varieties of Red Clover.
20. COUNTY OF NORTHUMBERLAND, Bul. Nos. 8 & 22 : Guide to Experiments.
21. ARMSTRONG COLLEGE, Bul. No. 15 : Grass and Clover Seeds.
22. HARPER ADAMS AGRICULTURAL COLLEGE : Joint Report for 1914.
23. THE NORTH OF SCOTLAND COLLEGE OF AGRICULTURE, Bul. No. 18 : Report on Grass Seed Mixtures, 1907–13.

24. UNIVERSITY COLLEGE OF N. WALES, Bangor: Eradication of Bracken, 1917.
25. UNIVERSITY COLLEGE OF WALES, Aberystwyth: The Improvement of Upland Pastures.
26. ——— The Eradication of Yellow Rattle.
27. ——— Seeds Mixtures for Leys: Permanent Grass.
28. BOARD OF AGRICULTURE, Special Leaflet No. 40: Notes on Breaking up Grass Land.
29. FOOD PROD. DEPT., Bul. No. 2, Ser. C: Rape Pastures.
30. ——— ,, No. 4, ,, Mole Draining.
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PRINCIPAL CONTENTS.

(For Complete List of Contents see page vii.)

The Breaking up of Grass Land - - - - - - 605

The National Food Supply in Peace and War - - - 615

The Corn Production Act, 1917 - - - - - - - 621

The Storage of Potatoes - - - - - - - - 629

Farm Accounts: Wintering Lambs on Turnips. *A. Loose* 634

Peasant Co-operation in Russia. *E. A. Brayley Hodgetts* - 637

The Empire Settlement Committee's Report - - - 641

Intercropping and Catch Cropping in Belgium - - 646

Maintenance of Supplies of Hay and other Fodder Crops 649

"Black-leg" or Black Stem-Rot in Potatoes - - - 653

Notes on Feeding Stuffs for October. *From the Animal Nutrition Institute, Cambridge University* - - - - - 657

Notes on Poultry Feeding - - - - - - - - 664

The National Egg Laying Test, 1917–18 - - - - 668

Credit for Farmers - - - - - - - - - 668

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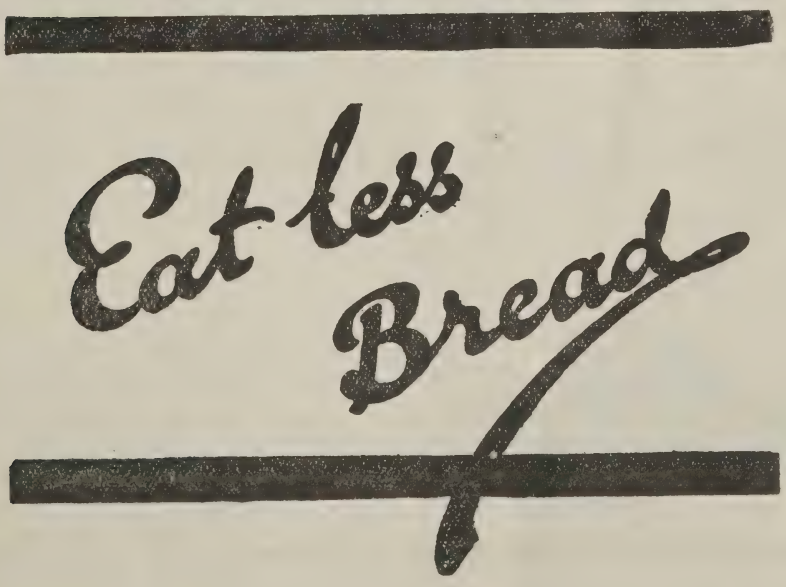
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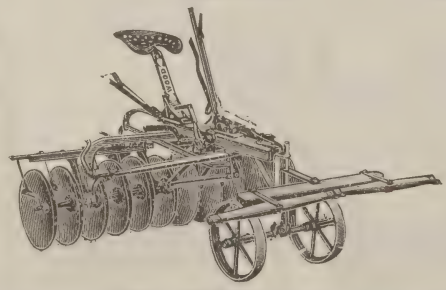
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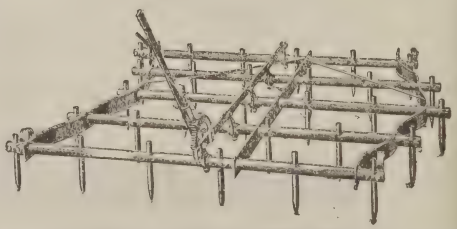
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CONTENTS.

PAGE

THE BREAKING UP OF GRASS LAND 605

THE NATIONAL FOOD SUPPLY IN PEACE AND WAR 615

THE CORN PRODUCTION ACT, 1917 621

THE STORAGE OF POTATOES 629

FARM ACCOUNTS: WINTERING LAMBS ON TURNIPS. *A. Loose* 634

PEASANT CO-OPERATION IN RUSSIA. *E. A. Brayley Hodgetts* 637

THE EMPIRE SETTLEMENT COMMITTEE'S REPORT 641

INTERCROPPING AND CATCH CROPPING IN BELGIUM 646

Maintenance of Supplies of Hay and other Fodder Crops 649

"Black-leg" or Black Stem Rot of Potatoes 653

Notes on Feeding Stuffs for October. *From the Animal Nutrition Institute, Cambridge University* 657

Notes on Poultry Feeding... 664

The National Egg Laying Test, 1917–18 668

Credit for Farmers 668

Official Notices and Circulars 671

Agricultural Returns for England and Wales, 1917—The Grain (Prices) Order, 1917—The Meat (Maximum Prices) Order, 1917—The Bacon, Ham and Lard (Maximum Prices) Order, 1917—The Cheese (Maximum Prices) Order, 1917—The Butter (Maximum Prices) Order, 1917—The Milk (Prices) Order, 1917—The Barley (Restriction) Order, 1917—The 1917 Crop (Restriction) Order, 1917—The Hop (Restriction) Order, 1917—Scheme for Harvesting Horse-chestnuts by School Children—Scheme for the Supply of Seed Wheat of the 1917 Crop—Superphosphate Order—Distribution of Superphosphate—The Potatoes (Immune Varieties) Order, 1917—Order taking Possession of Flax grown in the United Kingdom—Army Cattle Purchase—Reduction of Acreage under Hops—Testing the Farm Women—The National Food Journal.

Notes on Crop Prospects Abroad 693

Report of International Institute of Agriculture—France—Spain—Canada—United States—New Zealand.

Agricultural Conditions in England and Wales on 1st September 694

Agricultural Labour in England and Wales during August 695

Prevalence of Animal Diseases on the Continent 696

Weather in August 697

Diseases of Animals Acts 698

Prices of Agricultural Produce 699

Selected Contents of Periodicals 703

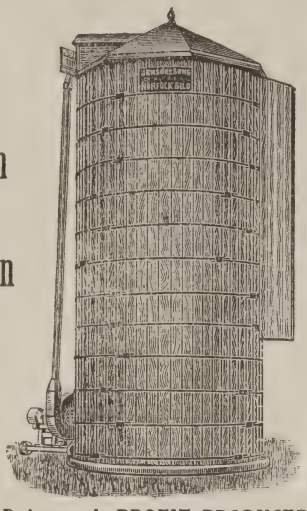
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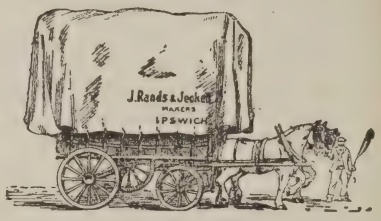
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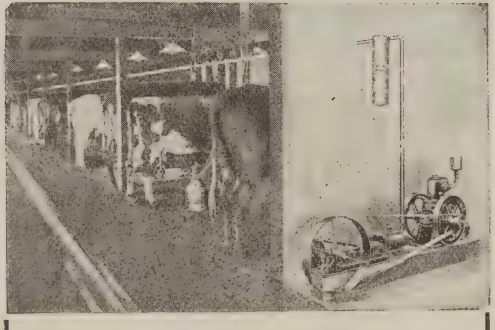
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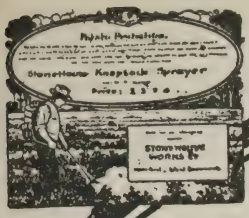
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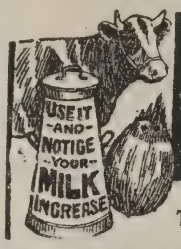
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